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Emergency Preparedness for Medical Care Providers

INSTRUCTORS MANUAL



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1. Introduction

Chemical, Biological, Radiation, Nuclear, and Explosives (CBRNE) emergencies increasingly threaten the health and safety of people worldwide. Chemical and biological agents have been used to create fear and cause harm. Explosives are used almost daily to injure and kill large numbers of people. And although radiation dispersal devices -- commonly called “dirty bombs”-- and nuclear weapons have not been used by terrorists to date, their potential use is a serious concern.

California’s medical care providers need to be prepared to respond to any disaster—intentional or accidental—that might arise. Traditionally, natural disasters and industrial accidents have posed the greatest threat to people in the state. CBRNE emergencies present new challenges. Education and training is necessary if California's medical care providers are to respond effectively to these threats.

This interactive CD-ROM will help prepare California’s medical personnel for CBRNE emergencies. This program is designed for everyone: care providers, support personnel, and administrators. It covers the threats likely to cause a CBRNE emergency, safety measures that all staff should know in the event of a CBRNE emergency, and actions that administrators can take to prepare their facilities.

Medical care providers are on the front lines when a CBRNE emergency occurs. We need to be ready. This CD-ROM will help us prepare today for what could happen tomorrow.

The California Hospital Bioterrorism Preparedness Program would like to acknowledge the UCLA Emergency Medicine Multimedia Education Working Group and Scott R. Votey, M.D. for software product, in collaboration with L31 Interface Technologies, Inc. It was created with the oversight and assistance of the California Hospital Bioterrorism Preparedness Committee and the California Emergency Medical Services Authority.

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2. Learner Levels

a. Overview

In order for a medical care facility to effectively respond to a CBRNE emergency, all personnel need to work as a team. Everyone must know their responsibilities, including how to protect their safety and the safety of others. For this reason Chemical • Biological • Radiological • Nuclear • Explosives: Emergency Preparedness for Medical Care Providers® is intended for all of the personnel in the hospitals and clinics of California, including care providers, support staff, and administrators. This includes doctors, nurses, laboratory workers, clerks, security officers, and many other job categories. This audience is diverse in terms of educational experience, knowledge, and job responsibilities. As an instructor you undoubtedly know how hard it is to teach to such a diverse group of learners.

The educational content on the CD-ROM is presented in two formats. The movie segments should be watched by all learners. The accompanying text is aimed at specific learner groups. Individual text topics can be accessed by clicking on the Videx Slides™ that appear as the movie plays. The entire text for each section can be printed by clicking on the Text function.

All medical care facility and pre-hospital care personnel have been categorized into four learning levels by the Hospital Bioterrorism Preparedness Planning Committee (HBPPC) for the purposes of CBRNE Preparedness Training. This CD-ROM can be used to train individuals or groups in all four learning levels.

In order for the CD to be an effective educational tool, learners should be assigned a learner level (1-4) prior to the use of the CD. Each level has specific educational goals, as well as a corresponding written examination. Learners should be held responsible only for the material associated with their level.

The four levels, including appropriate personnel and learner activities, are shown in Table 1.

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TABLE 1: Learner Levels

Level	Description	Examples	Activities
1	<p style="text-align: center;">Basic Training Level for All Staff</p> <p style="text-align: center;">(1 ½ Hours)</p>	<p>Hospital:</p> <ul style="list-style-type: none"> • New Employee Orientation • Administrative Support Staff • Admitting • Ancillary Services • Dietary Personnel • Engineering • Environmental Services • Facilities Management • Housekeeping • Media Relations • Parking and Transportation • Morgue Services • Security Officers • Call Centers • Mailroom • IT Staff • Base Hospital Staff/MICNs <p>Clinic / Physicians Office:</p> <ul style="list-style-type: none"> • Administrative support staff • Office Staff having contact with patients <p>EMS:</p> <ul style="list-style-type: none"> • Administrative Support Staff • All Ambulance Personnel • Dispatchers • Fire Nurse Liaisons • Critical Care Transport Staff and flight crews <p>Public Health:</p> <ul style="list-style-type: none"> • All clinical and administrative staff • Epidemiologists, Disease Control Investigators • Industrial Hygienists • Environmental Specialists <p>California Poison Control Centers: All staff</p>	<p style="text-align: center;">View video only.</p> <p>(Level 1 learners are <u>not</u> required to read any of the text materials.)</p> <p style="text-align: center;">Complete Competency Assessment Examination for Level 1</p>

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TABLE 1: Learner Levels

Level	Description	Examples	Activities
2	Intermediate Training Level (3 Hours)	Hospital: <ul style="list-style-type: none"> • All general (floor) nurses. • Most physicians, except as noted in Level 3. • Emergency Dept. Technicians • Employee Health Services • Laboratory Services • Pharmacy Personnel • Radiology Personnel • Respiratory Therapy Clinic / Physicians Office: <ul style="list-style-type: none"> • Physicians and Nurses EMS: <ul style="list-style-type: none"> • Administrative Support Staff • Advanced Ambulance Personnel Public Health: <ul style="list-style-type: none"> • Clinical Staff • Epidemiologists Regional Disaster Medical and Health Specialists	View video and read all Videx text labeled Level 2. Complete Competency Assessment Examination for Level 2

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TABLE 1: Learner Levels

Level	Description	Examples	Activities
3	<p>Advanced Training Level for Direct Patient Care Providers and “Front Line” Staff</p> <p>(4 Hours)</p>	<p>Hospital:</p> <ul style="list-style-type: none"> Nurse Managers and high level care providers, especially those in the Emergency Department and Critical Care Units. Physicians involved in higher risk direct patient care, especially Emergency Medicine, Critical Care, and Infectious Disease specialists. Urgent Care staff Emergency Managers/Disaster Planners Decontamination Response Teams/Hazardous Material Teams Infection Control Practitioners <p>Clinic / Physicians Office:</p> <ul style="list-style-type: none"> Physicians FNP/PA providers <p>EMS:</p> <ul style="list-style-type: none"> Emergency or Disaster Operations Center Staff Bioterrorism Coordinators Communications Staff <p>Public Health:</p> <ul style="list-style-type: none"> Health Officer Infectious Disease, Immunization, and Epidemiology Staff Bioterrorism Coordinators 	<p>View video and read all Videx labeled Level 3.</p> <p>(Note: Printable Treatment Summaries are provided as supplemental material for staff involved in patient treatment.)</p> <p>Complete Competency Assessment Examination for Level 3</p>
Level	Description	Examples	Activities
4	<p>Executive Training Level</p> <p>(2 ½ Hours)</p>	<p>Hospital:</p> <ul style="list-style-type: none"> Director of Hospital Operations CEO, CAO, COO Administrator-on-Call All Executive -Level Positions Board Members <p>Clinic / Physicians Office:</p> <ul style="list-style-type: none"> COO or Administrator <p>EMS:</p> <ul style="list-style-type: none"> Administration <p>Public Health:</p> <ul style="list-style-type: none"> Health Administrator Department Heads Dealing with Response Issues 	<p>View video. Read Videx labeled Level 4 in Preparedness Section</p> <p>There is no Competency Assessment Examination for Level 4</p>

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TABLE 2: Staff Training guide
How to Use this CD

Training Level	Level I: Basic Training Level	Level II: Intermediate Training Level	Level III: Advanced Training Level	Level IV: Executive Training Level
Trainees	All staff	Direct patient care providers	Direct patient care providers involved in evaluation and management	Facility administrators, executives, and board members
Hours of training	1 ½ hours	3 hours	4 hours	2 ½ hours
Watch video?	Yes	Yes	Yes	Yes
Read basic Videx text?	No	Yes	Yes	Read Videx in Preparedness section only
Read in-depth Videx text?	No	No	Yes	No
Read threats algorithm?	No	Yes	Yes	No
Read printable treatment summaries?	No	No	Summaries are supplemental	No
Complete Competency Assessment Examination?	Yes	Yes	Yes	No

b. Educational Goals

The educational goals for each learner level are provided in Appendix A.

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3. Instructional Modes

A. Instructional Mode Overview

This CD can be used effectively in four different instructional modes:

- Mode 1: Independent Learner
- Mode 2: Instructor Facilitated Independent Learning
- Mode 3: Group Training with Instructor
- Mode 4: Instructor Led Lecture

B. Description of Instructional Modes

Mode 1: Independent Learning

Since this product was created as a CD-ROM, it can run on most computers that use the Windows™ operating system. It does not run on computers using the Apple/Mac operating system.

The advantages of allowing independent learners to access the CD-ROM include convenience and flexibility. Learners can read the text in the Videx Slides™ at their own speed, and they can repeat movie sections as desired. This can also be a cost effective training mode since instructor and class time are not required.

The disadvantages of the Independent Learner Mode include the lack of supervision and the absence of an instructor. If learners have questions about the use or the content of the CD, they do not have immediate access to qualified trainers to answer the questions.

Mode 1 Recommendations:

All learner levels use the CD independently. All independent learners should be provided with:

- ✓ Appendix B: Instructions for Independent Users
- ✓ Appropriate Learner Level Competency Examination.
- ✓ Any specific policies and/or procedures for your facility or service that employees must review as part of this training

Mode 2: Instructor Facilitated Independent Learning

The Instructor Facilitated Independent Learning mode encompasses the use of the training program by a group of independent users who attend a session in a learning center or seminar room equipped with computers. Learners all have the training program loaded on an individual computer and the instructor guides them through its use as needed.

All learner levels can utilize the CD independently with an instructor present. Mode 2 is best suited for Levels 2-4, as this learner level could benefit from having an instructor present for questions, but otherwise will be able to proceed on their own through the CD.

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Mode 2 Recommendations:

All learner levels use the CD independently in an instructor supervised setting. All independent learners should be provided with:

- ✓ Appendix B: Instructions for Independent Users.
- ✓ Appropriate Learner Level Competency Examination.
- ✓ Any specific policies and/or procedures for your facility or service that employees must review as part of this training.

Mode 3: Group Training with Instructor

The CD-ROM also can be used in a group setting in which an instructor takes charge of explaining the CD and playing the movie to a group of learners. Learners watch the movie in a group, thus losing individual control of the CD functions, but gaining the added benefit of an instructor who would be able to answer questions and provide additional information specific to the facility where the training is taking place.

The Group Training Mode can be used for training Level 1-4 learners. It is expected that Group Training will be most effective with Levels 1, 2, and 4.

For Levels 2 and 4, instructors should provide printouts of text in the Videx Slides™ that corresponds to each level. (See Resources in Section 6 below for more on printing using the Text function).

Mode 3 Recommendations:

Learners should be provided with:

- ✓ For Levels **2 and 4**, instructors should provide printouts of text in the Videx Slides™ that corresponds to each level. (See Resources in Section 6 below for more on printing using the Text function).
- ✓ Appropriate Learner Level Competency Examination.
- ✓ Any specific policies and/or procedures for your facility or service that employees must review as part of this training.

Mode 4: Instructor-Led Lecture

Instructors can use the CD to structure and complement lectures on CBRNE preparedness training. Instructors can start and stop the movie as desired, and provide additional information not contained in the movie. Depending on instructors' preferences and lecture styles, individual Videx Slides™ can be opened to access images. The "Key Points" section at the end of each sub-topic of the CD also provides an excellent opportunity for instructors to highlight the important points of that section.

Depending on the length of the training session, the group of learners, and the instructor's teaching goals, the CD provides material for 2-4 hours of lecture sessions.

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The outlines in Appendix D. highlight the important points that could be included in lectures that use the CD-ROM. We provide these outlines as guidelines to help instructors preparing to lecture on this material. It is not expected that instructors would use the lecture outline in its entirety, but would modify the outline and present material in a way that best fit the needs of the learners. Please note that the written examinations focus on the outline presented in Appendix C. See Appendix B for examination materials, which can be modified by instructors as needed.

Mode 4 Recommendations:

Instructor-Led Lecture Mode is recommended for Levels 2-3. It is conceivable, for example, that patient care providers could earn continuing education credit by attending a CBRNE preparedness lecture that incorporates Chemical • Biological • Radiological • Nuclear • Explosives: Emergency Preparedness for Medical Care Providers.®

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4. Installing and Copying the CD-ROM

a. Installation

To install the CD-ROM, place the CD into the appropriate drive in the computer. A welcome screen should appear on the monitor. Simply click "Start," and the program will begin.

If the welcome screen does not appear on the monitor, users should click "My Computer," then click the icon for the CD-ROM drive, and then double click the Auto Run file.

b. Copies

Copies of the CD can be made for educational use. All users must agree to the "End-User License Agreement for the *Chemical, Biological, Radiological, Nuclear, Explosives: Emergency Preparedness for Medical Care Providers*® Software Product", as described in Appendix E. and on the CD-ROM.

NOTE: Most computers are unable to copy the CD using the copy and paste functions. Therefore, in most cases, CDs must be copied in computers that have disk-to-disk copy functions.

See the Frequently Asked Questions and Helpful Tips in 5.c for more details.

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5. Navigating the CD-ROM

a. Navigation

The CD-ROM is designed to be used by learners with varying levels of computer literacy. Appendix A provides in-depth instructions for users of the CD, including instructions on how to watch the video, how to print the text, and how to navigate the various components of the program.

Depending on the instructional mode chosen, instructors likely will want to practice using the CD-ROM on their own computers as well as on computers that will be used by learners in group or individual settings (e.g., in a seminar room or learning center).

b. Content

The content is organized according to:

- **THREATS:** Chemical, Biological, Radiological, Nuclear, and Explosives threats are treated separately. Information about all threats includes: classification of agents, definitions, decontamination protocol, health effects, and treatment. Step-by-step guides to treatment for all threats, including unknown threats, are provided. An algorithm for identifying unknown threats also is provided.
- **SAFETY:** This section covers issues of staff and patient safety, as well as security. Issues covered include: preparedness, personal protective equipment, decontamination, treatment, and treatment follow-up.
- **PREPAREDNESS:** This section educates facility personnel on the emergency response system, logistical preparations, and emergency plans that include CBRNE contingencies. Training, education, and response related to CBRNE emergencies also are discussed in detail.

c. Frequently Asked Questions and Helpful Tips

FAQ: Can I run this CD on any computer?

The CD can run on almost any computer using the Windows™ 98 or a later version of the Windows™ operating system. It does not run on computers that use the Apple/Mac operating system.

TIP: As with many DVDs and CD-ROMs, the newer the computer, the more efficiently the CD will run.

FAQ: How long will it take to watch this CD?

Uninterrupted, the CD takes approximately 72 minutes to watch: Threats = 37 minutes; Safety = 15 minutes; Preparedness = 20 minutes. This amount of time varies slightly depending on the computer used. Instructors should budget approximately 90 minutes for a session with Level 1 users, who do not read any of the accompanying text. This would include enough time for the brief competency assessment, which should take approximately 10 minutes.

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TIP: Instructors and administrators in charge of training should take into account the amount of movie + Videx Slides™ they intend to use during a training session. If learners need time to simply watch the CD, one hour should be sufficient. Up to 4 hours might be needed for independent Level 3 users. Time needed for lectures and other instructor-led training will depend on the goals of the session and the amount of CD material used by teachers and trainers.

FAQ: When should I read the Videx slides?

The Videx slides contain overviews and in-depth information about the topics that appear in the movie. If you want to read the Videx, you can click on each one as it pops up or you can wait until the screen fills with Videx and click on each one in order.

TIP: Videx Slides™ disappear after the movie segment completes or when the screen has filled with Videx, as new ones replace the old. If you want to read the Videx as you watch each segment, simply stop the movie before the end of each segment and then read the Videx at your leisure. If you miss your chance, don't worry. You can go back to that segment of the movie and watch it again later. You also can print entire sections of the slides and make photocopies as needed, depending on training and facility needs. See the Resources section (6.a) below for more details on printing.

FAQ: Why are the video and the sound out of sync sometimes?

The optical drive of your computer determines how fast the movie appears on the screen. Older computers cannot always keep up with the movie.

TIP: The faster and newer the computer, the better the CD runs.

FAQ: The movie seems small. Can I make the movie screen bigger?

The movie is sized for optimal on-screen viewing. You can make the screen bigger if you wish. However, you should be aware that the movie might seem slightly out of focus or pixilated (i.e., fuzzy around the edges).

TIP: If you do not like the small movie screen, try re-setting your monitor to make the movie bigger. This is easy to do on newer systems (i.e., running Windows™ 2000, XP, or later). In Windows™, go to:

Start? Settings? Control Panel? Display? Settings? Screen Area.

You can change the screen area to 1024 x 768 or even 800 x 600. At 800 x 600 the movie will fill a greater portion of the screen, but usually appears fuzzy. Note: If your computer runs on an earlier version of Windows™, you might have to re-boot after re-sizing the screen.

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6. Resources

a. Using the TEXT function

As described in the Instruction Sheet in Appendix A, the Text function allows users of the CD-ROM to print full sections of the text.

Before the video for each section ends, you may print entire sections of Videx in text form by clicking the Text button. This function applies to SAFETY and PREPAREDNESS without exception.

For the THREATS section, the Text print function is divided into sub-topics, so clicking Text during the Chemical section will print the Chemical Threats Videx. Likewise, clicking Text during Biological Threats will give all related Videx. Clicking anywhere in the Radiation, Nuclear, or Explosives section will provide a printout of all three of these sections.

All Videx that are PDF files need to be printed separately by clicking Print when viewing those Videx.

Instructors and administrators might want to create a master copy of the printout and use this as the training manual from which photocopies can be made for in-house CBRNE preparedness training. The training manual can be used by instructors to advise administrators charged with creating emergency operation plans, and also can be used as a resource in case of a suspected CBRNE event.

b. Using the RESOURCE function

Clicking on the Resource function will take users to a list of articles, books, websites, and other materials that can be used for those interested in learning more about CBRNE emergencies. We encourage instructors, administrators, patient care providers, and other personnel charged with emergency response and preparedness to consult these resources for further development of facility emergency plans and for further education on safety, diagnosis, treatment, and other related issues.

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7. Competency Assessment

a. Assessment Examination:

A competency assessment has been developed for Learner levels 1, 2, and 3 to test the learning of the users, and can provide organizations with documentation of program completion. See Appendix C for the competency assessment examinations.

The assessments may be used as presented, or they can be used as models and modified according to the needs of the specific facilities or services. It is encouraged that each organization also includes questions on facility/organization specific policies and procedures to reinforce learning.

As with other areas of healthcare education, competency is best assessed in actual performance of assigned tasks. Exercises and other training sessions are essential to ensure that all workers understand their responsibilities and the appropriate protocol for different CBRNE emergencies.

This training program is also pending approval by the Office of Domestic Preparedness (ODP). Please check the website for approval status.

b. Continuing Education Hours

Organizations with Continuing Education provider numbers may utilize this CD-ROM training program to offer CE hours for learners. The EMS Authority is unable to offer CE hours for this training course.

Suggested CE hours for the program are based on learner levels:

- Level 1: Two hours of continuing education credit
- Level 2: Three hours of continuing education credit
- Level 3: Four hours of continuing education credit
- Level 4: Two hours of continuing education credit

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8. Customization

Instructors can use the materials on the CD-ROM to create supplemental handouts and teaching materials. Cut and paste can be done from the Videx Slides™ and also can be performed by accessing the text files on the CD-ROM. To access the text files, insert the CD, go to "My Computer," click on the CD-ROM drive, and enter the App folder, then the Text folder. There the HTML and Word files can be found, as well as images. HTML files marked with the letter "L" followed by section numbers, an underscore, and the word "all" or "rest" are the section text files that allow you to access Videx from entire sections. For example, the file "L1b_all" contains the chemical threats Videx; "L2_all" contains the HTML files of the entire safety section; "L1_rest" contains Radiation, Nuclear, and Explosives.

Instructors might wish to customize the materials by providing information specific to their own medical care facility or specific to a group of learners. Facility-specific emergency operation plans, safety procedures, and other important information should be made readily available to all personnel at all times.

a. For independent learners

Supplemental handouts can be made for independent learners. Handouts can be distributed on a per-use basis with the Instruction Sheet for Individual Users.

b. For group learners

Supplemental handouts also can be distributed to group learners. If instructors access images or text using the customization instructions provided above, the supplemental handouts can provide facility-specific, in-depth information on topics covered in the CD-ROM.

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Appendix A: Learner Specific Educational Objectives

Learner Level 1
Educational Goals

1. Understand the potential for a CBRNE attack and the role the health care system would play if an attack occurred.
2. Learn about the types of CBRNE threats and how attacks may be recognized.
3. Learn safety procedures necessary to protect yourself and others in the presence of a suspected or confirmed CBRNE agent or event.
4. Learn what personal protective equipment is and how it is used to protect the health of medical personnel in a CBRNE event.
5. Learn what decontamination is and its role in the treatment of chemical, biological, and radiological exposed victims.
6. Learn the importance of a facility emergency operations plan and understanding one's individual role in an emergency operations plan.

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Learner Level 2
Educational Goals

1. Understand the potential for a CBRNE attack, and the role the health care system would play if an attack occurred.
2. Learn about the types of potential CBRNE attacks, including the difference between covert and overt uses of those threats, and how attacks may be recognized.
3. Learn the classification of chemical weapon agents and the clinical presentations of each of the main categories.
 - Nerve agents (e.g., sarin)
 - Blister agents (e.g., sulfur mustard)
 - Choking agents (e.g., phosgene and chlorine)
 - Blood agents (e.g., cyanide)
 - Other agents (including tear gas-like agents, vomiting agents, and hallucinogenic agents)
4. Identify the CDC Category A *Bioterrorism Agents of Concern* and the most important type of illness each causes.
 - Anthrax
 - Botulism
 - Plague
 - Smallpox
 - Tularemia
 - Viral hemorrhagic fevers (Ebola, etc.)
5. Understand the basic principles of radioactive particle contamination and the safety measures that should be taken to protect yourself and others.
6. Learn the basic mechanisms of blast injuries and the types of injuries that result from an explosion.
7. Learn safety procedures necessary to protect yourself and others in the presence of a suspected or confirmed CBRNE agent or event.
8. Learn the essential components of personal protective equipment (PPE), the circumstances in which PPE is needed, and its proper use.
9. Understand the essential procedures in the decontamination of chemical, biological, and radiological exposed victims.
10. Learn the components of a facility emergency operations plan, the activation of the plan in response to a large scale CBRNE event, and the chain of communication used to enable an effective response.

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Learner Level 3
Educational Goals

1. Learn about the types of potential CBRNE attacks, including the difference between covert and overt uses of those threats, and how attacks may be recognized.
2. Learn the classification of chemical weapon agents, the clinical presentations of each of the main categories, and the essentials of patient management.
 - Nerve agents (e.g., sarin)
 - Blister agents (e.g., sulfur mustard)
 - Choking agents (e.g., phosgene and chlorine)
 - Blood agents (e.g., cyanide)
 - Other agents (including tear gas-like agents, vomiting agents, and hallucinogenic agents)
3. Be able to identify the CDC Category A Bioterrorism Agents of Concern, the types of illness each causes, and the essentials of patient management.
 - Anthrax
 - Botulism
 - Plague
 - Smallpox
 - Tularemia
 - Viral hemorrhagic fevers (Ebola, etc.)
4. Understand the basic principles of radioactive particle contamination, the safety measures that should be taken, and the essentials of patient management.
5. Learn the mechanisms of blast injuries, the types of injuries that result from an explosion, and the essentials of patient management.
6. Learn the questions pertinent to identifying an unknown threat, as well as the initial management until the cause of the event is definitively identified.
7. Learn safety procedures necessary to protect staff and patients in the presence of a suspected or confirmed CBRNE agent or event.
8. Learn the levels of personal protective equipment (Levels A, B, C, and D), the circumstances in which each level of PPE is needed, and its proper use.
9. Describe the steps in the decontamination of chemical, biological, and radiological exposed victims, including the actions necessary to ensure the safety of personnel involved in decontamination.
10. Learn the components of a facility emergency operations plan, the activation of the plan in response to a large scale CBRNE event, and the chain of communication used to enable an effective response.

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Learner Level 4
Educational Goals

1. Understand the potential for a CBRNE attack and the role the health care system would play if an attack occurred.
2. Learn about the types of CBRNE threats and how attacks may occur.
 - Chemical
 - Biological
 - Radiological
 - Nuclear
 - Explosives
3. Learn basic safety procedures necessary to protect yourself and others in the presence of a suspected or confirmed CBRNE agent or event.
4. Understand the importance of personal protective equipment and decontamination capabilities in protecting medical facility personnel and patients in a CBRNE event.
5. Learn the components of a medical care facility's emergency operations plan that are essential to CBRNE-readiness.
6. Learn how the Standardized Emergency Management System (SEMS) integrates your facility fits into the local, regional, state, and federal systems that are in place to respond to CBRNE events.

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Appendix B: Instruction Sheet for Independent Users

Instruction Sheet for Independent Users of Chemical • Biological • Radiological • Nuclear • Explosives: Emergency Preparedness for Medical Care Providers.®

Introduction

The iQube is divided into three sections: Threats, Safety, and Preparedness. The sections are indicated by the titles on the screen and the accompanying icons on each of the iQube's visible faces.

To start a section, simply click on the icon or title that you are interested in. To return to the iQube home screen, click on the small iQube icon in the top right-hand corner of the screen.

Video

Each of the sections contains a video that may be controlled much like a standard video or CD player, with buttons for play, pause, fast-forward, and rewind.

As the video plays, slides will appear around the video screen, providing additional, in-depth information on the subject at hand.

Videx

Videx slides contain the text that accompanies the video. By clicking on the slides as they appear, you will pause the video and be able to read the text at your own speed. When finished reading, you can click the Video button to resume watching the video.

Before the video for each section ends, you may print entire sections of Videx in text form by clicking the Text button. This function applies to SAFETY and PREPAREDNESS without exception. For the THREATS section, the Text print function is divided into sub-topics, so clicking Text during the Chemical section will print the Chemical Threats Videx. Likewise, clicking Text during Biological Threats will give all related Videx. Clicking anywhere in the Radiation, Nuclear, or Explosives section will provide a printout of all three of these sections.

All Videx that are PDF files need to be printed separately by clicking Print when viewing those Videx.

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Learner Levels

Personnel must be assigned a Learner Level of 1, 2, 3 or 4.

Learners assigned to Level 1 are not required to read any of the material found in the slides.

Learners assigned to Levels 2 through 4 are responsible for reading the material in slides identified with their number.

In some of the slides assigned to more than one level, specific material is designated for each level. If there is no such identification, you should read all the material. Within each slide, learners are only required to read the portion identified with their level.

Some slides are identified as “Supplemental.” These slides are not required reading for any of the four Learner Levels, but provide additional in-depth information on the topic for interested learners and, principally, for physicians, nurses, and other direct care providers in Learner Level 3.

Viewing Options

You may decide to watch the video in its entirety or go directly to a specific subject.

Pop-Ups

Some sub-sections include pop-up menus activated by scrolling over them. Clicking on these will allow you to go directly to a specific sub-topic.

Extras

In the upper left-hand corner of the screen you will find buttons that let you exit the iQube, access the table of contents, or search for specific subjects of interest. To obtain additional assistance with the system software, please select Help from the table of contents.

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Appendix C. Written Examinations

LEVEL 1 COMPETENCY ASSESSMENT EXAMINATION

Answer True or False

1. Some of the chemicals that could be used in a weapon can stay on victims' skin or clothing for many hours, and touching them without proper protective equipment can make you ill.

True False

2. Chemicals that could be used in a weapon all smell bad, so you will be able to tell if they are present and you are being exposed.

True False

3. People exposed to certain biological agents may not become ill until many days later.

True False

4. Persons contaminated with radioactive particles usually feel a burning sensation on their skin.

True False

5. Victims contaminated in a chemical or biological attack should be brought into patient care areas at once for treatment.

True False

6. Waste water used in decontaminating patients is contaminated, and might make you sick if it gets on your skin or clothing.

True False

7. Following any chemical, biological, or radiation attack, all victims will be decontaminated before arriving at medical care facilities.

True False

8. Standard latex medical gloves provide adequate protection for disposing of waste contaminated by a chemical weapon agent.

True False

9. Chemical, biological, and radiation attacks are crimes, and victims' clothing should be saved because it may be used as evidence.

True False

10. Each medical care facility has a plan in place so that employees can work together effectively if there is a natural or man-made disaster.

True False

Key: 1) True 2) False 3) True 4) False 5) False 6) True 7) False 8) False 9) True 10) True

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LEVEL 2 COMPETENCY ASSESSMENT EXAMINATION

Multiple Choice Questions. Pick the single best answer.

1. Chemical weapon agents are classified by their clinical effects. Each of the following is an important class of chemical agents except one:

- A. Choking agents
- B. Blood agents
- C. Liver agents
- D. Nerve agents
- E. Blister agents

2. An outbreak of botulism is occurring in a nearby community. The hospital in that community is unable to care for all the patients from the outbreak, and patients are to be transferred to your facility. Which of the following actions should your facility take?

- A. Prepare an area where the botulism patients can be isolated so that they do not spread the disease to others.
- B. Ensure that your facility has an adequate stock of appropriate antibiotics to treat the botulism patients.
- C. Ensure that staffing is adequate to care for the expected number of patients.
- D. A and C
- E. All of the above.

3. The 1995 Tokyo subway sarin attack taught us which of the following lessons about emergency response to CBRNE events:

- A. Interagency coordination is crucial for an effective response to CBRNE events.
- B. Immediate decontamination is a priority for protecting victims' health and for preventing secondary contamination.
- C. Appropriate personal protective equipment (PPE) must be worn by all personnel who may be exposed to contaminated patients.
- D. Medical personnel must have access to management guidelines for common hazardous agents.
- E. All of the above.

4. You are treating multiple victims of an explosion. A 23 year old male is experiencing chest pain and shortness of breath. He should have the following evaluation and treatment:

- A. Administer high flow oxygen.
- B. Intubation and mechanical ventilation to prevent hypoxia and to reduce the work of breathing.
- C. Chest radiograph (chest x-ray) should be taken as soon as possible to rule out a pneumothorax.
- D. A and C.
- E. All of the above

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LEVEL 2 COMPETENCY ASSESSMENT EXAMINATION

5. Vaccines are currently stockpiled in the United States to prevent which of the following CDC Category A Bioterrorism Agents of Concern:
- A. Smallpox
 - B. Plague
 - C. Botulism
 - D. A and C
 - E. B and C
6. All of the following should raise the suspicion of a chemical or biological weapon attack except one:
- A. Spraying activity in an inappropriate area.
 - B. Smoke or detectable material in the air.
 - C. Animals in the region are ill or dead, but humans are unaffected.
 - D. An unexplained odor inappropriate for the context of its surroundings.
 - E. An unexplained deposit of material in an area where casualties occurred (e.g. liquid droplets in absence of watering or rain).
7. An outbreak of smallpox has been reported in your county. Appropriate containment measures include:
- A. Suspected and confirmed cases should be isolated.
 - B. Everyone that may have had contact with a person ill with smallpox should be vaccinated at once.
 - C. Healthcare and law enforcement personnel, and all others involved in containing the outbreak should be vaccinated at once.
 - D. Transfer of smallpox patients to designated facilities equipped for their care.
 - E. All of the above
8. If a medical care provider who does not have personal protective equipment (PPE) is directly exposed to a high-level chemical or biological agent release all of the following actions are appropriate except one:
- A. Immediately leave the area of the exposure.
 - B. Go to the specified decontamination area at once if it is nearby and is ready to receive casualties.
 - C. If there is no available decontamination facility, remove all clothing and thoroughly wash yourself with mild soap and water.
 - D. Scrub hard to remove all contamination.
 - E. Do not touch or put back on contaminated clothing.

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LEVEL 2 COMPETENCY ASSESSMENT EXAMINATION

9. The victim of a chemical attack is noted to have very small pupils. Which class of chemical agents should be suspected?
- A. Blister agents
 - B. Blood agents
 - C. Tearing agents
 - D. Nerve agents
 - E. Choking agents
10. Each of the following statements is true regarding identifying and reporting CBRNE events except one:
- A. Medical facilities play a key role in identifying threats to public health.
 - B. Biological agents may be used covertly so that medical facility personnel may be the first to recognize an event has occurred.
 - C. Law enforcement agencies should not be notified until a suspected chemical or biological attack is definitively confirmed.
 - D. The state of California requires that any occurrence that threatens the welfare, safety, or health of patients, visitors, or personnel must be reported to the local health officer and to the appropriate state or federal agencies.
 - E. When a CBRNE event is suspected by medical facility staff, immediate internal and external notification is required.

Answer True or False

11. Some of the chemicals that could be used in a weapon can stay on victims' skin or clothing for many hours, and touching them without proper protective equipment can make you ill.

True False

12. Chemicals that could be used in a weapon all smell bad, so you will be able to tell if they are present and you are being exposed.

True False

13. Persons contaminated with radioactive particles usually feel a burning sensation on their skin.

True False

14. Waste water used in decontaminating patients is contaminated, and might make you sick if it gets on your skin or clothing.

True False

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LEVEL 2 COMPETENCY ASSESSMENT EXAMINATION

15. Following any chemical, biological, or radiation attack, all victims will be decontaminated before arriving at medical care facilities.
- True False
16. Standard latex medical gloves provide adequate protection for disposing of waste contaminated by a chemical weapon agent.
- True False
17. Chemical, biological, and radiation attacks are crimes, and victims' clothing should be saved because it may be used as evidence.
- True False
18. Level D personal protective equipment (PPE) provides the highest level of protection and is appropriate for highly dangerous chemical agents.
- True False
19. The Hospital Emergency Incident Command System [HEICS] employs a logical management structure to assist medical facilities in staying operational during a disaster.
- True False
20. Following a CBRNE event, patients and their families will experience psychological effects, but medical care facility personnel are not at risk for these problems.
- True False

Key:

- | | |
|-------|-----------|
| 1) C | 11) True |
| 2) C | 12) False |
| 3) E | 13) False |
| 4) D | 14) True |
| 5) A | 15) False |
| 6) C | 16) False |
| 7) E | 17) True |
| 8) D | 18) False |
| 9) D | 19) True |
| 10) C | 20) False |

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LEVEL 3 COMPETENCY ASSESSMENT EXAMINATION

Multiple Choice Questions. Pick the single best answer.

1. Chemical weapon agents are classified by their clinical effects. Each of the following is an important class of chemical agents except one:
 - A. Choking agents
 - B. Blood agents
 - C. Liver agents
 - D. Nerve agents
 - E. Blister agents

2. An outbreak of botulism is occurring in a nearby community. The hospital in that community is unable to care for all the patients from the outbreak, and patients are to be transferred to your facility. Which of the following actions should your facility take?
 - A. Prepare an area where the botulism patients can be isolated so that they do not spread the disease to others.
 - B. Ensure that your facility has an adequate stock of appropriate antibiotics to treat the botulism patients.
 - C. Ensure that staffing is adequate to care for the expected number of patients.
 - D. A and C
 - E. All of the above.

3. Administration of radioactive iodine is appropriate therapy following which radiation exposure events?
 - A. Exposure to radioactive fallout following a thermonuclear explosion.
 - B. Exposure to high levels of gamma radiation.
 - C. Exposure to a radioactive cesium release from a medical facility.
 - D. Exposure to radioactive fallout from a nuclear power plant accident.
 - E. All of the above.

4. The 1995 Tokyo subway sarin attack taught us which of the following lessons about emergency response to CBRNE events:
 - A. Interagency coordination is crucial for an effective response to CBRNE events.
 - B. Immediate decontamination is a priority for protecting victims' health and for preventing secondary contamination.
 - C. Appropriate personal protective equipment (PPE) must be worn by all personnel who may be exposed to contaminated patients.
 - D. Medical personnel must have access to management guidelines for common hazardous agents.
 - E. All of the above.

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LEVEL 3 COMPETENCY ASSESSMENT EXAMINATION

5. You are treating multiple victims of an explosion. A 23 year old male is experiencing chest pain and shortness of breath. He should have the following evaluation and treatment:
- A. High flow oxygen should be administered.
 - B. He should be intubated and mechanically ventilated to prevent hypoxia and to reduce the work of breathing.
 - C. A chest radiograph should be taken as soon as possible to rule out a pneumothorax.
 - D. A and C.
 - E. All of the above
6. Another victim of the explosion has abdominal tenderness, but lacks visible signs of injury. An abdominal CT scan has been ordered. How should he be managed?
- A. The CT scan should be performed. If it is negative the patient can be discharged.
 - B. The CT scan should be cancelled and exploratory surgery performed at once.
 - C. The patient should be closely inspected for abdominal puncture wounds from flying debris. If no puncture wounds are found, the abdominal CT scan should be cancelled, and the patient can be discharged.
 - D. The CT scan should be performed. If it is negative the patient should be admitted for observation.
7. The main effects of all of the following chemical agents occur within seconds to a few minutes except one:
- A. Sarin (a nerve agent)
 - B. Cyanide (a blood agent)
 - C. Chlorine (a choking agent)
 - D. Sulfur mustard (a blister agent)
 - E. Mace (a tearing agent)
8. You are notified that a patient that you cared for yesterday has now been diagnosed as having pneumonic plague. The patient had a fever and a cough when you cared for her. What actions should you take?
- A. No action is necessary since pneumonic plague can not be spread person-to- person.
 - B. Ensure that you get vaccinated with the plague vaccine at once so that you do not become ill.
 - C. Begin a course of antibiotics at once so that you do not become ill.
 - D. Notify your family that you must be quarantined until it becomes known if you will develop plague.
 - E. None of the above.

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LEVEL 3 COMPETENCY ASSESSMENT EXAMINATION

9. Vaccines are currently stockpiled in the United States to prevent which of the following CDC Category A Bioterrorism Agents of Concern:

- A. Smallpox
- B. Plague
- C. Botulism
- D. A and C
- E. B and C

10. All of the following should raise the suspicion of a chemical or biological weapon attack except one:

- A. Spraying activity in an inappropriate area.
- B. Smoke or detectable material in the air.
- C. Animals in the region are ill or dead, but humans are unaffected.
- D. An unexplained odor inappropriate for the context of its surroundings.
- E. An unexplained deposit of material in an area where casualties occurred (e.g. liquid droplets in absence of watering or rain).

11. The victim of a chemical attack is noted to have very small pupils. Which class of chemical agents should be suspected?

- A. Blister agents
- B. Blood agents
- C. Tearing agents
- D. Nerve agents
- E. Choking agents

12. An outbreak of smallpox has been reported in your county. Appropriate containment measures include:

- A. Suspected and confirmed cases should be isolated.
- B. Everyone that may have had contact with a person ill with smallpox should be vaccinated at once.
- C. Healthcare and law enforcement personnel, and all others involved in containing the outbreak should be vaccinated at once.
- D. Transfer of smallpox patients to designated facilities equipped for their care.
- E. All of the above

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LEVEL 3 COMPETENCY ASSESSMENT EXAMINATION

13. Atropine should be administered as soon as possible to victims suffering from which class of chemical agents:

- A. Vomiting agents
- B. Nerve agents
- C. Blood agents
- D. Blister agents
- E. Choking agents

14. If a medical care provider who does not have personal protective equipment is directly exposed to a high-level chemical or biological agent release all of the following actions are appropriate except one:

- A. Immediately leave the area of the exposure.
- B. Go to the specified decontamination area at once if it is nearby and is ready to receive casualties.
- C. If there is no available decontamination facility, remove all clothing and thoroughly wash yourself with mild soap and water.
- D. Scrub hard to remove all contamination.
- E. Do not touch or put back on contaminated clothing.

15. Each of the following statements is true regarding identifying and reporting CBRNE events except one:

- A. Medical facilities play a key role in identifying threats to public health.
- B. Biological agents may be used covertly so that medical facility personnel may be the first to recognize an event has occurred.
- C. Law enforcement agencies should not be notified until a suspected chemical or biological attack is definitively confirmed.
- D. The state of California requires that any occurrence that threatens the welfare, safety, or health of patients, visitors, or personnel must be reported to the local health officer and to the appropriate state or federal agencies.
- E. When a CBRNE event is suspected by medical facility staff, immediate internal and external notification is required.

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LEVEL 3 COMPETENCY ASSESSMENT EXAMINATION

Answer True or False

16. Victims contaminated in a chemical or biological attack should be brought into patient care areas at once for treatment.

True False

17. Waste water used in decontaminating patients is contaminated, and might make you sick if it gets on your skin or clothing.

True False

18. Following any chemical, biological, or radiation attack, all victims will be decontaminated before arriving at medical care facilities.

True False

19. Standard latex medical gloves provide adequate protection for disposing of waste contaminated by a chemical weapon agent.

True False

20. Chemical, biological, and radiation attacks are crimes, and victims' clothing should be saved because it may be used as evidence.

True False

21. Each medical care facility has a plan in place so that employees can work together effectively if there is a natural or man-made disaster.

True False

22. Level D personal protective equipment (PPE) provides the highest level of protection and is appropriate for highly dangerous chemical agents.

True False

23. The Hospital Emergency Incident Command System [HEICS] employs a logical management structure to assist medical facilities in staying operational during a disaster.

True False

24. Following a CBRNE event, patients and their families will experience psychological effects, but medical care facility personnel are not at risk for these problems.

True False

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LEVEL 3 COMPETENCY ASSESSMENT EXAMINATION

25. The doctor responsible for caring for the victims of a CBRNE event should be the one to communicate with the representatives of the news media.

True

False

Key:

- 1) C
- 2) C
- 3) D
- 4) E
- 5) D
- 6) D
- 7) D
- 8) C
- 9) A
- 10) C
- 11) D
- 12) E
- 13) B

- 14) D
- 15) C
- 16) False
- 17) True
- 18) False
- 19) False
- 20) True
- 21) True
- 22) False
- 23) True
- 24) False
- 25) False

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Appendix D. Instructor Guides for Lecture Format Instruction
(Lectures for Levels 2 and 3)

Below we provide an outline for lectures based on Chemical • Biological • Radiological • Nuclear • Explosives: Emergency Preparedness for Medical Care Providers.®

It is expected that the full lecture would need to be adapted to the time and purpose of each training session. The full lecture is best suited for a long training session for Levels 2 and 3. Used in its entirety, this outline would result in approximately 4 hours of lecture (Threats = 2 hours; Safety = ¾ hour; Preparedness = 1 ¼ hours). Shorter sessions should use a shorter form of the lecture. Information intended for Level 3 learners is noted in the materials. Lecture should be abbreviated for Level 4, with a focus on Preparedness.

Instructors can adapt the lecture outline to their needs, providing supplemental information as desired. Customization of this outline can be done by cutting and pasting the text into a Word file, or instructors can follow the outline. It is expected that facility-specific information will be provided by instructors as appropriate to the groups receiving the training.

Instructors can play the movie on the CD-ROM, pausing as needed to explain or click on the Videx slides for further images and text. The lecture outline below guides instructors through the CD-ROM movie and Videx slides in the order of THREATS, SAFETY, and PREPAREDNESS.

I. THREATS
A. Chemical

1. *What Is a Chemical Weapon?*
 - a. Chemical agents have a broad spectrum of physical properties.
 - b. They can exist in an aerosol, gas, liquid, or solid state.
2. *Chemical Weapon Dispersal Systems*
 - a. To cause injury, a chemical must be taken into the body through ingestion, inhalation, or absorption.
 - b. Chemical weapons agents are generally used in liquid or gas form and are more likely to be delivered through the air.
3. *The Dangers of Chemical Weapons*
 - a. Chemical agents' effects can be immediate or delayed, thus giving would-be terrorists the opportunity to choose the agent that most suits the desired effect.
 - b. Chemical agents can be delivered by a variety of routes.
 - c. Many agents do not have high costs associated with their production or dispersion.
 - d. Many chemicals or their ingredients are widely available.
 - e. Many chemicals are easily transported. For instance, transportation of phosgene, cyanide, anhydrous ammonia, and chlorine is a daily event in most large cities. Rail cars, which can contain up to 30,000 gallons of a chemical, are susceptible to attack.

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4. *Chemical vs. Biological Weapons*

- a. There are similarities and differences between chemical and biological weapons agents.
- b. The differences include:
 1. Chemical agents typically have a dramatic and rapid effect. Although some biological agents also act this way (e.g., trichothecene mycotoxins, botulinum toxin, or staphylococcal enterotoxin B), in the case of many other biological agents, days to weeks may pass before people become symptomatic.
 2. Human skin is often the target of chemical weapons, but skin functions as an effective barrier with most biological weapons.
- c. The similarities include:
 1. The delivery systems used to launch chemical and biological attacks are similar and include explosive shells, rockets, missiles, aircraft bombs, mines, and spray devices. In addition, water and food stores can be contaminated and used as delivery systems.
 2. With chemical and biological agent threats, equipment or supplies could also be contaminated, thus posing a risk of secondary contamination upon contact.

5. *Chemical Agent Properties*

- a. There are several chemical properties that influence the effectiveness of a chemical weapon:
 1. Persistence: This characteristic refers to how long a chemical persists in the environment. It is the single most important environmental feature of a chemical weapon.
 2. Volatility: This is the tendency of a liquid to evaporate and form a vapor.
 3. Concentration-Time Product: This refers to the concentration of a toxic agent multiplied by the length of time people are exposed to the agent.
 4. Latency: This is the time between exposure to a chemical agent and the onset of symptoms.

6. *How Are Chemical Agents Classified?*

- a. Agents are classified by their clinical effects. The categories of chemical agents include:
 1. Nerve agents (e.g., sarin)
 2. Blister agents (e.g., sulfur mustard)
 3. Choking agents (e.g., phosgene and chlorine)
 4. Blood agents (e.g., cyanide)
 5. Other agents (including tear gas-like agents, vomiting agents, and hallucinogenic agents)

7. *Industrial Chemical Agents*

- a. Industrial chemicals are not classified as chemical weapons, but many industrial chemicals have effects similar to chemical weapons agents.

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8. Comparing Chemical Agents

- a. Chemical agents come in a variety of forms and have varying smells and appearances. Not all can be smelled or seen, so it can be particularly difficult to detect some agents.

9. What Are Nerve Agents?

- a. Nerve agents include tabun (GA), sarin (GB), soman (GD), GF, and VX.
- b. Nerve agents are chemically similar to organophosphate pesticides.

10. Nerve Agent Health Effects

- a. Nerve agents pose the greatest risk when they are inhaled following their release as vapors. They also pose a hazard through direct contact with the skin, although skin absorption of nerve agents has slower effects than inhalation.
- b. Widespread symptoms can occur within a minute of inhalation of high concentrations of a nerve agent.
- c. Exposed patients may develop a constellation of symptoms, including vomiting, diarrhea, abdominal pains, muscle twitching and muscle weakness, visual difficulties, drooling, confusion, weakness, convulsions, loss of consciousness, and severe breathing difficulty. The inability to breathe effectively is often the cause of death
- d. The physiological effects of nerve agents (and the organophosphate pesticides they are chemically similar to) can be remembered through the acronym SLUDGE:
 - S**alivation
 - L**acrimation (excessive tears)
 - U**rination
 - D**iaphoresis (sweating)
 - G**astrointestinal Distress (vomiting and diarrhea)
 - E**xcitation and agitation

11. Nerve Agent Treatment

- a. Nerve agents are extremely toxic. These agents can cause loss of consciousness and convulsions within seconds; and death from respiratory failure within minutes of exposure.
- b. Remember that you should always protect yourself before assisting others. Always use the appropriate personal protective equipment that you have been trained to use.
- c. To treat victims:
 - 1. Immediately remove victims from the source of exposure and into a source of fresh air.
 - 2. Rapidly decontaminate victims while taking care not to become contaminated by residual chemical on the patient's clothing or skin.
 - 3. Administer antidotes immediately (i.e., atropine, pralidoxime, and diazepam) if possible.
 - 4. Provide supportive care (e.g., assisted breathing).
- d. [Level 3 only]: Initial field treatment involves administering atropine (2mg) combined with pralidoxime (600 mg), often with the addition of diazepam (10mg) intramuscularly.

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12. *What Are Blister Agents?*

- a. Blister agents, also known as vesicants, include mustards (e.g., H, HD, HT), lewisite (L), and phosgene oxime (CX).
- b. Mustard is the only blister agent that has been used on a battlefield. It was used in World War I, and also more recently during the Iran-Iraq war in the 1980s.
- c. Blister agents exist as an oily liquid that with variable volatility (tendency to form a vapor or gas). They have low volatility, so may persist for more than a week in some cases.

13. *Blister Agent Health Effects*

- a. The health effects of the main class of blister agents (i.e., mustards) occur after inhalation or direct contact with the skin or eyes.
- b. The eyes are the most sensitive organs to the effects of mustard agents.
- c. Hours to days following a blister agent exposure, fluid-filled blisters may develop, leading to sloughing of the skin.
- d. Following high levels of exposures, the airways and lungs also can be damaged.

14. *Blister Agent Treatment*

- a. Decontamination within a few minutes after exposure is the only effective means of preventing damage from blister agents.
- b. Mustard agents have no specific antidote treatment.
- c. Lewisite skin lesions exposure can be treated with topical and systemic intramuscular injections of an antidote called dimercaprol or British Anti-Lewisite (BAL). Topical BAL has been recommended but there are no available commercial preparations.
- d. Phosgene oxime (CX) has no antidote and treatment is similar to that of the mustard agents.

15. *What Are Choking Agents?*

- a. Choking agents are chemicals that irritate and damage the throat, airway, and lungs, leading to the sensation of choking and shortness of breath.
- b. They include phosgene (CG), phosphine, ammonia, chlorine, hydrogen chloride, and nitrogen oxides.
- c. There have been many instances of accidental industrial releases of choking agents.
- d. Most of the deaths in the 1984 Bhopal, India, industrial accident resulted from the lung irritant effects caused by the release of methyl isocyanate gas.
- e. Chlorine and phosgene gases were used in World War I, and phosgene gas accounted for a majority of gas-related deaths during the war.

16. *Choking Agent Health Effects*

- a. These agents primarily affect the lungs, although they can also irritate the eyes, upper airway (e.g., nose and throat), and skin.
- b. Some choking agents have a very rapid onset of effects, while others may have a delayed onset with little initial irritation of the eyes, nose or throat.
- c. Physicians should follow agent-specific treatment protocols when treating patients who have been exposed to choking agents.

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17. What Are Blood Agents?

- a. Blood agents cripple the body's ability to function by disrupting the enzyme complex responsible for the utilization of oxygen within the cell.
- b. These agents are highly lethal.
- c. Blood agents include hydrogen cyanide (AC) and cyanogen chloride (CK). Cyanogen chloride differs from hydrogen cyanide, as it irritates the eyes, airways, and lungs, similar to choking agents.
- d. There is a very narrow margin between levels sufficient to cause symptoms and levels that produce death.
- e. All of these agents are highly volatile, so they tend to dissipate rapidly upon release into the air.

18. Blood Agent Health Effects

- a. Blood agents block the ability of cells within the body to utilize oxygen effectively.
- b. Physical effects on the body can be seen within seconds. These effects are not reversed by the administration of supplemental oxygen.
- c. The patient may become anxious, hyperventilate, and develop a headache with dizziness and vomiting.
- d. Approximately 15 seconds after inhaling a large amount of cyanide, victims become anxious and start to hyperventilate. Thirty seconds after exposure, the patient may begin to convulse. Breathing stops within 3 to 5 minutes. Cardiac arrest occurs in 6 to 10 minutes, followed by death.
- e. Symptoms vary in proportion to the amount of blood agent exposure.

19. Blood Agent Treatment

- a. Immediate treatment involves removing patients from ongoing exposure to the blood agent and assisting their breathing.
- b. Successful treatment requires the rapid administration of antidotes.
- c. Antidote therapy for cyanide blood agents involves the intravenous administration of sodium nitrite and sodium thiosulfate.
- d. [Level 3 only]: Approximately 300 milligrams (mg) of sodium nitrite are injected over a period of three minutes, while a dose of 12.5 grams (gm) of sodium thiosulfate is injected over a 10-minute period. These antidotes serve to bind cyanide and assist in its excretion out of the body. The sodium nitrite and sodium thiosulfate therapy is specific to cyanide blood agents. This therapy is not helpful for other chemical weapons, such as the nerve agents.

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20. Incapacitating Agents

- a. Incapacitating agents are chemical weapon agents that are designed to temporarily incapacitate rather than kill their intended victims.
- b. Their effects pass with time, and supportive care typically results in full recovery. Incapacitating agents can be dispersed into the air by munitions as aerosols or released into water supplies.
- c. Groups of agents that have these effects include:
 - 1. Hallucinogens (e.g., BZ and LSD)
 - 2. Vomiting agents (e.g., adamsite)
 - 3. Tearing agents (e.g., CN)
- d. Some experts refer to all three groups of agents as incapacitating agents, while others refer to tearing agents as riot control agents.
- e. Hallucinogenic agents:
 - 1. Cause patients to develop confusion, sleepiness, inability to concentrate, hallucinations, and even states of delirium.
 - 2. Their effects can last for hours to days.
- f. Vomiting agents:
 - 1. Cause general irritation on initial exposure, followed by headache, nausea, vomiting, diarrhea, abdominal cramps, and mental status changes.
 - 2. Symptoms typically persist for an hour or more after exposure, and death has been reported with excessive exposure. The effects of tearing agents last only minutes.

21. Tearing Agents

- a. Tearing agents include CS (tear gas) and CN (Mace 7), which are commonly used as riot-control agents.
- b. These are immediate-onset but short-acting solid agents that typically are released into the air.
- c. Exposed victims immediately experience a severe burning sensation and tearing in their eyes and irritation of the nose and throat. The agents can also cause coughing, difficulty breathing and vomiting.
- d. These effects begin to improve in minutes and disappear within several hours. However, direct exposure of the surface of the eye to tearing agents may result in scarring and permanent damage.
- e. Treatment involves removing oneself from the source of ongoing exposure and washing the eyes with copious amounts of water.

22. What Are Industrial Chemical Threats?

- a. Facts related to industrial chemical threats include:
 - 1. Over 120,000 industrial chemicals are produced that are known to have harmful effects on humans.
 - 2. Many industrial chemicals are produced in large quantities and stored in facilities around the world.
 - 3. Large quantities of these potentially harmful chemicals could be released accidentally or as the result of an intentional attack.
 - 4. When released into the atmosphere, some industrial chemicals provide a warning because they are released in the form of irritating gases or noxious fumes.

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- b. Facts related to exposure to industrial chemicals include:
 - 1. People can be exposed to industrial chemicals by inhaling them, swallowing them, or coming into direct contact with them.
 - 2. In most cases, industrial chemical exposures occur as the result of inhaling chemical mists or vapors. In these cases, many industrial chemicals act as mucous membrane irritants, and cause skin or eye, throat and airway irritation, coughing, and shortness of breath.
- c. The most devastating civilian chemical accident occurred in Bhopal, India, when a water leak triggered an industrial explosion and a large amount of methyl isocyanate was released. The exact death tolls of this 1984 accident are unknown, but numbers range from 3,650 to unofficial reports of over 5,000 people killed as a result of the gas leak.

23. *Refinery Accidents and Burning Oil Wells*

- a. A large refinery fire would have similar health effects to those created in war situations by ignited oil wells.
- b. Some of the short-term health effects included coughing, shortness of breath, and eye irritation.
- c. The exact long-term effects of exposure to oil fire smoke exposure remain unclear.

24. *Personal Protective Equipment*

- a. Chemical agents can enter the body by several routes, including the mouth, nose, eyes, and the skin.
- b. Personal protective equipment (PPE) is designed to prevent entry through these routes.

25. *Detection Devices*

- a. Detection devices exist that can identify a variety of chemical agents (such as nerve agents and blister agents).
- b. The devices include chemical agent detector paper, electronic monitoring devices, and water testing devices.
- c. There are certain agents for which no widely field detection methods exist (such as choking agents).
- d. Detection devices primarily are utilized by Hazmat teams and the military.
- e. The appropriate maintenance, interpretation and use of many of these devices require specialized training.

26. *Decontamination and Triage*

- a. The care needed following a chemical agent or hazardous industrial chemical exposure will vary depending on the substance.
- b. The well being of the exposed victims and care facility staff is dependent on fully decontaminating exposed victims before they enter the facility.
- c. Ideally, immediate and adequate decontamination of exposed patients is done near the scene of the exposure.

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27. Antidotes

- a. Antidotes are agent specific, so agent identification is extremely important in the treatment of patients with chemical exposure.
- b. Many chemical agents, including blister agents, choking agents, and hazardous industrial chemicals, do not have specific antidotes. Treatment in these cases is supportive.
- c. Nerve agents (such as sarin) are the classic example of extremely dangerous chemical agents that have specific antidotes (for example, atropine and pralidoxime).
- d. Care for patients exposed to chemical agents involves four important steps:
 1. Recognition of exposure.
 2. Prompt decontamination, within minutes of exposure if possible.
 3. Clinical or chemical identification of the agent.
 4. Effective administration of antidotes as indicated.

B. Biological

1. Why Would Anyone Use a Biological Weapon?

- a. There are a few practical reasons why someone might use biological weapons.
- b. Biological weapons have a strong ability to induce public panic and fear, thus they are very potent agents of terrorism.
- c. Very small amounts of biological agents can have devastating effects. For example, a small packet of anthrax spores has the potential to make large numbers of people seriously ill over an extended period of time.
- d. Anthrax and other agents can be relatively easy to obtain.
- e. Biological agents are relatively difficult to detect.
- f. Many biological agents that might be weaponized have a delayed onset of effects.

2. Classification of Biological Weapons [Instructor suggestion: Focus on Category A and only give examples from B and C if time permits.]

- a. The Centers for Disease Control (CDC) has created a list of "Bioterrorism Agents of Concern." The list classifies the agents in terms of the severity of health risk that they pose.
- b. Category A agents
 1. Definitions: Category A encompasses high-priority agents include organisms that pose a risk to national security because they:
 - Can be easily disseminated or transmitted from person-to-person;
 - Result in high mortality and have the potential for major public health impact;
 - Might cause public panic and social disruption;
 - Require special action for public health preparedness.
 2. List of Category A agents:
 - Anthrax (*Bacillus anthracis*)
 - Botulism (*Clostridium botulinum* toxin)
 - Plague (*Yersinia pestis*)
 - Smallpox (*variola major*)
 - Tularemia (*Francisella tularensis*)
 - Viral hemorrhagic fevers (Ebola, Marburg, Lassa, etc.)

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c. Category B agents

1. Definitions: Category B includes the second highest priority agents. The list includes those agents that:

- Are moderately easy to disseminate;
- Result in moderate morbidity and low mortality;
- Require enhanced diagnostic capacity and disease surveillance.

2. List of Category B agents:

- Brucellosis (*Brucella* species)
- Epsilon toxin of *Clostridium perfringens*
- Food safety threats (e.g., *Salmonella* species, *Escherichia coli* 0157:H7, *Shigella*)
- Glanders (*Burkholderia mallei*)
- Meliodosis (*Burkholderia pseudomallei*)
- Psittacosis (*Chlamydia psittaci*)
- Q fever (*Coxiella burnetii*)
- Ricin toxin from *Ricinus communis* (castor beans)
- Staphylococcal enterotoxin B
- Typhus fever (*Rickettsia prowazekii*)
- Viral encephalitis (e.g., Venezuelan equine encephalitis, eastern equine encephalitis, western equine encephalitis)
- Water safety threats (e.g., *Vibrio cholerae*, *Cryptosporidium parvum*)

d. Category C agents

1. Definitions: Category C encompasses the third highest priority agents and includes emerging pathogens that could be engineered for mass dissemination in the future because of:

- Availability;
- Ease of production and dissemination;
- Potential for high mortality and major health impact.

2. List of agents that have been listed under Category C:

- Nipah virus
- Hantavirus
- Tickborne hemorrhagic fever viruses
- Tickborne encephalitis viruses
- Yellow fever virus
- Multidrug-resistant tuberculosis

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3. Person-to-Person Spread

- a. The diseases caused by biological agents have different modes of transmission.
- b. Can the disease be spread from person to person?
 - Inhalation anthrax: NO.
 - Botulism: NO.
 - Bubonic plague: NO.
 - Pneumonic plague: YES. High risk.
 - Smallpox: YES. High risk.
 - Pneumonic tularemia: NO.
 - Typhoidal tularemia: NO.
 - Skin ulcers and draining lymph nodes: YES.
 - Viral Hemorrhagic Fevers: YES. Moderate to high risk. Varies with specific virus.

4. What Is Anthrax?

- a. Anthrax is the illness caused by the bacterium *Bacillus anthracis*.
- b. Naturally acquired anthrax occurs in humans when they are exposed to infected animals or contaminated animal products.
- c. *Bacillus anthracis* produces spores, a form of the bacterium that is very durable and can resist heat and cold. It is thought that under normal environmental conditions the spores can persist for as long as 40 years.

5. Can Anthrax Be Spread Person-to-Person?

- a. It is highly unlikely that anthrax would spread from one person to another.
- b. Nonetheless, when dealing with inhalational or cutaneous anthrax, Standard Precautions should be employed.

6. Cutaneous Anthrax [Instructors: Show images in slide while talking.]

- a. One form of anthrax infection is the skin (or cutaneous) form.
- b. Currently, approximately ninety-five percent of naturally occurring anthrax infections are due to spores of *Bacillus anthracis* entering a cut or abrasion on the skin.

7. Inhalational Anthrax

- a. The first symptoms of inhalational anthrax are typically non-specific and have been described as being flu-like.
- b. The symptoms can include mild fever, muscle aches, fatigue, and sometimes a cough and mild chest discomfort. At this stage, inhalational anthrax can be difficult to differentiate from influenza.
- c. Unlike patients with inhalational anthrax, adults with influenza or other viral respiratory illnesses do not usually have shortness of breath and vomiting, but often have rhinorrhea and nasal congestion.
- d. Symptoms then progress rapidly over several hours to 1 day to include: high fever, severe shortness of breath, and increasingly severe sub-sternal chest pain.
- e. Bacteria soon spread from the lymph nodes into the bloodstream and the remainder of the body, leading to sepsis and multi-organ failure.
- f. Even with optimal treatment, many individuals die within 48 hours. Death can occur in as many as 95% of treated cases if therapy does not begin until more than 48 hours after the onset of symptoms. Death is universal in untreated cases.

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8. How Is Anthrax Diagnosed? [Level 3 only]

- a. Anthrax is diagnosed by isolating *B. anthracis* from the blood, skin lesions, or respiratory secretions or by measuring specific antibodies in the blood of persons with suspected cases.
- b. If laboratory testing is delayed or unavailable, patients suspected of having any of the three forms of anthrax should be started on antibiotics immediately. Delay in antibiotic therapy can increase mortality.
- c. Rapid tests exist to help determine if *Bacillus anthracis* is present in a given environment, but these tests cannot help diagnose illness in humans.

9. Treatment of Anthrax

- a. Although most anthrax is treatable with a broad range of antibiotics, drug-resistant strains do occur naturally and via intentional genetic manipulation.
- b. Many experts consider fluoroquinolones (e.g., ciprofloxacin, levofloxacin, moxifloxacin, etc.) the drugs of choice for all forms of anthrax until specific antimicrobial susceptibility results are known.
- c. There is a vaccine for anthrax, but it has limited availability.
- d. [Level 3 Only]
 - 1. Antibiotics: Doxycycline, a more widely manufactured, less expensive option, is likely to be as effective as the fluoroquinolones in most cases. Thus, for large outbreaks in which the susceptibility of the strain is known and in which cost and availability become important issues, use of doxycycline may be preferred. Individuals who develop inhalational anthrax or cutaneous anthrax of the head and neck (or cutaneous anthrax with systemic signs) need hospitalization and intravenous treatment with two or more antimicrobial agents predicted to be effective.
 - 2. Vaccination: Persons exposed to anthrax should be immunized if possible and treated with at least a 30-day course of ciprofloxacin or doxycycline. If the anthrax vaccine is unavailable, post-exposure prophylaxis entails antibiotic treatment for a period of 60 days.

10. Prevention of Anthrax

- a. If exposure to anthrax spores is suspected, antibiotic treatment should begin immediately in order to prevent the development of infection.
- b. Decontamination: People should be decontaminated if there is a possibility that anthrax spores have landed on their clothing or skin.
- c. Precautions: Care providers should use Airborne Precautions (i.e., facemask, shoe covers, gloves, gowns, and eye protection) when dealing with victims of anthrax spore exposure who have not yet been decontaminated. All healthcare workers should be fitted with NIOSH-approved respirators that are at least as protective as an N95 respirator. In addition, workers should avoid touching their skin, eyes, or other mucous membranes since contaminated gloves may transfer *B. anthracis* spores to other body sites.

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c. [Level 3 Only]: Treatment Recommendations

1. Evaluations of anthrax outbreaks have found variable incubation periods, ranging from 3 to 45 days. Thus, a 60-day course of oral ciprofloxacin (500 mg orally twice a day) or doxycycline (100 mg orally twice a day) should begin as soon as possible following exposure to ensure adequate prophylaxis.
2. No antibiotic therapy is needed for caregivers who use Airborne Precautions.

11. *What Is Smallpox?*

- a. Smallpox is a serious, contagious, and sometimes fatal infectious disease caused by the *variola* virus.
- b. The eradication of smallpox is one of the greatest successes of modern medicine. In 1980, the World Health Organization declared that smallpox occurring in nature had been eliminated globally. Routine vaccination against smallpox among the general public was stopped because it was no longer believed necessary.
- c. Prior to eradication, smallpox caused major epidemics among human populations for many centuries.
- d. Since eradication, the smallpox virus has only been known to exist in stocks held in a few countries around the world.

12. *What Are the Symptoms of Smallpox?* [Instructors: Show images in slide while talking.]

- a. During the first phase of symptoms (prodromal phase), people are usually too ill to carry on their normal activities. Patients become acutely ill with profound fatigue, shaking chills, and a high fever. This phase lasts for 2 to 4 days.
- b. After the prodromal phase, patients develop the first sign of the characteristic smallpox rash: small red spots on the tongue and in the mouth. These spots develop into sores that break open and spread large amounts of the virus into the mouth and throat. At this time, the person is most contagious. Around the time the sores in the mouth break down and a rash appears on the skin.
- c. [Level 3 only]
 1. Characteristic Rash: After the prodromal phase, a rash with centrifugal spread develops, starting on the face and spreading to the arms and legs and then to the hands and feet. Usually the rash spreads to all parts of the body within 24 hours. As the rash appears, the fever resolves and the patient improves. By the third day of the rash, the rash becomes raised bumps. By day 4, the bumps fill with a thick, opaque fluid and often have a depression in the center called umbilication (this is a major distinguishing characteristic of smallpox). Fever often will rise again at this time and remain high until scabs form over the lesions.
 2. Progression of disease: At day 5 of the rash, the lesions become pustules-sharply raised, usually round and firm to the touch as if there were a small round object under the skin. The pustules begin to form a crust and then scab. By the end of the second week, after the rash appears, most of the lesions have formed scabs. The scabs begin to fall off. Most scabs will have fallen off three weeks after the rash appears. The person is contagious to others until all of the scabs have fallen off.

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13. *How Is Smallpox Diagnosed?*

- a. Smallpox can be diagnosed by clinicians based on its characteristic rash.
- b. Any suspected case of smallpox must be treated as a health emergency and reported immediately to appropriate authorities.
- c. Specialized laboratories can perform confirmatory testing on the sentinel case, which is the first case to come to medical attention in a given outbreak.
- d. [Level 3 only]

The Centers for Disease Control has an online diagnostic Risk Evaluation Algorithm that can be used for diagnosis when no other cases of smallpox are known. The tool helps physicians evaluate risk for smallpox based on:

- 1. Type of Rash Illness
- 2. Major Smallpox Criteria
- 3. Minor Smallpox Criteria

14. *Distinguishing Smallpox from Other Infectious Rashes*

- a. A characteristic of the smallpox rash is that all lesions are the same age, size, and appearance all over the body.
- b. The disease most commonly confused with smallpox is chickenpox. During the first 2 to 3 days of rash, it may be all extremely difficult to distinguish between the two.
- c. Smallpox also might be confused with measles, although measles patients rarely appear toxic and their lesions are generally discrete and do not evolve into pustules or scabs.
- d. [Level 3 only]: Differential Diagnosis
 - 1. Smallpox Rash: About 2 weeks following exposure to smallpox, patients develop a febrile prodrome closely followed by the emergence of a centrifugal (i.e., face first, spreading to the trunk and extremities), macular rash over a period of approximately 24 hours. Smallpox lesions evolve slowly from macules to papules to pustules over approximately 2-4 days. By day 4 of the rash, the bumps fill with a thick, opaque fluid and often have a characteristic depression in the center called umbilication. In addition to the centrifugal distribution of lesions that are all the same age, the umbilication of lesions is a major distinguishing characteristic of smallpox. After about 5 days, the vesicular lesions become hardened pustules, which finally crust over to result in diffuse scabs by the end of the second week of the rash. In contrast with other infectious rashes, victims of smallpox frequently appear toxic or moribund.
 - 2. Smallpox also might be confused with chickenpox or measles, and the CDC diagnostic tool can help care providers differentiate between the diseases.
 - 3. Smallpox vs. Monkeypox: The monkeypox virus is related to the smallpox virus and thus the prodromal phase and rash can be very similar. Monkeypox is distinguished from smallpox based on epidemiological information, with an exposure to a wild or exotic mammalian pet (either sick or not) or a probable or confirmed human case of monkeypox being the determining clues.

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15. Treatment of Smallpox

- a. Currently, there is no proven treatment for clinical smallpox (*variola*).
- b. Vaccination during the first week of incubation might prevent or reduce the severity of the disease in those exposed to smallpox cases.
- c. [Level 3 only]: Smallpox Treatment
 - 1. Antivirals and Vaccination
 - a. Clinical trials conducted during the smallpox era that evaluated several antiviral compounds failed to demonstrate clinical efficacy for these compounds. Evaluation of modern day antiviral compounds at CDC is ongoing.
 - b. Vaccination during the first week of incubation might prevent or reduce the severity of the disease in those exposed to smallpox cases.
 - b. Immunotherapy with vaccinia immune globulin (VIG) given during the incubation period may also reduce the severity of the disease, but has never been available in adequate supply to be widely used.
 - 2. Fluid and Electrolyte Balance
 - 3. Skin Care
 - 4. Monitor for Possible Complications, including :
 - a. Hemorrhagic
 - b. Secondary bacterial infections
 - c. Corneal ulceration and/or keratitis
 - d. Arthritis or osteomyelitis variolosa
 - e. Respiratory complications
 - f. Encephalitis
 - g. Gastrointestinal
 - h. Genitourinary system

16. The Smallpox Vaccine

- a. Prevention of smallpox has depended on vaccination since 1796.
- b. Until recently, the U.S. government provided the vaccine only to a few hundred scientists and medical professionals who worked with smallpox and similar viruses in a research setting.
- c. After the events of September and October 2001, however, the U.S. government took further actions to improve its level of preparedness against terrorism.
- d. One of many such measures-designed specifically to prepare for an intentional release of the smallpox virus-included updating and releasing a smallpox response plan.
- e. Currently, the U.S. government has access to enough smallpox vaccine to effectively respond to a smallpox outbreak in the United States.
- f. [Level 3 only]: Outbreak and Vaccine
 - 1. Outbreak: In the event of a suspected case of smallpox, it will be crucial to quickly and efficiently diagnose in order to ensure that the "ring vaccination" program quickly controls the outbreak. Suspected and confirmed cases will need to be quickly moved to facilities that provide appropriate health care, vaccination, and isolation in order to prevent additional spread of smallpox.

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2. Effectiveness of Vaccine: The World Health Organization successfully used the smallpox vaccine to eradicate natural smallpox from the planet. Within 10 days of receiving a single smallpox vaccination, 95% of vaccinees are completely protected for 3-5 years, with decreasing immunity thereafter. Reliable protection after revaccination lasts about 10 years.

17. Containing a Smallpox Outbreak

The three primary principles of smallpox containment are:

a. Isolation

1. In a smallpox outbreak, isolation of confirmed or suspected smallpox patient(s) may be accomplished by several different methods depending upon certain circumstances (number of patients, severity of illness, availability of resources, etc.).
2. The goal of isolation is to prevent transmission of smallpox from an infectious patient to non-immune individuals while maintaining an appropriate care and comfort level for the patient. Patients generally are considered infectious from the time the rash appears until all scabs have separated, approximately 3-4 weeks.
3. Medical personnel should consult with public health officials to determine the most appropriate method for isolation.

b. Ring Vaccination

1. In the event of a suspected case of smallpox, it will be crucial to quickly and efficiently diagnose in order to ensure that the "ring vaccination" program quickly controls the outbreak.
2. Suspected and confirmed cases will need to be quickly moved to facilities that provide appropriate health care, vaccination, and isolation in order to prevent additional spread of smallpox.

c. Pre-Exposure Vaccination

1. A large number of public health personnel (such as public health and law enforcement personnel and first responders) will be needed to control the outbreak and healthcare workers will be needed to diagnose, manage, and treat cases are likely to be exposed to smallpox cases as part of their work responsibilities.
2. These individuals must also be vaccinated as soon as possible after the first case of smallpox is confirmed.

18. What Is Plague?

- a. Plague is a bacterial infection caused by *Yersinia pestis*.
- b. It is a disease of rodents (rats, squirrels, etc.) that typically spreads to humans via fleas. Like anthrax, the plague bacterium can cause several different forms of disease, most commonly bubonic, septicemic, and pneumonic.
- c. Most naturally occurring plague cases are of the bubonic form of the disease, which accounts for 80-90% of cases in the United States.
- d. Naturally occurring pneumonic plague is uncommon, although small outbreaks do occur.
- e. All types of plague are readily controlled by standard public health response measures. Approximately 14% (1 in 7) of all plague cases in the United States are fatal.

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19. Forms of Plague

- a. Bubonic Plague [Instructors: Show image in slide while talking.]: The most common form of naturally occurring plague is the bubonic plague. The word *bubo* is derived from the Latin for owls' eyes; bubonic plague gets its name from the large, tender, swollen lymph nodes resembling owls' eyes that develop in infected patients.
- b. Pneumonic Plague
 - 1. Inhalation of the plague bacterium results in a severe pneumonia referred to as pneumonic plague. Naturally occurring pneumonic plague is now uncommon.
 - 2. If the plague bacterium were to be used as a weapon, it would most likely be spread as an aerosol to result in the pneumonic form of plague.
 - 3. Pneumonic plague can be spread person-to-person via respiratory secretions.
 - 4. The initial manifestations of pneumonic plague are non-specific with fatigue, fever, headache, and sore throat. Patients then rapidly develop a severe pneumonia with high fever, chills, cough, bloody sputum, and shortness of breath.
- c. [Level 3 only]: Plague Details
 - 1. Septicemic plague is characterized by dangerously low blood pressure, clotting abnormalities, and multi-organ failure. Often there is death of the skin, which produces a black discoloration--hence the term Black Death. Without treatment, the fatality rate is high (50%).
 - 2. The incubation period of pneumonic plague is usually 1-3 days. Patients may develop sepsis; death occurs in over 50% of cases.

20. Treatment of Plague

- a. Early treatment of pneumonic plague is essential. Once plague is confirmed or strongly suspected in a particular area, anyone in that area with fever (of 38.5°C or higher) or cough should immediately be treated for presumptive pneumonic plague.
- b. All patients with plague should be isolated for the first 48 hours after the initiation of treatment.
- c. Numerous antibiotics are active against plague, including some very commonly used antibiotics such as doxycycline, ciprofloxacin, and gentamicin.
- d. [Level 3 only]: Plague Treatment In-Depth
 - 1. Patients with pneumonia must be isolated until they have completed at least 4 days of antibiotic therapy.
 - 2. Individuals closely related with the patient, particularly in cases with pneumonia, should be traced, identified, and evaluated.
 - 3. Antibiotics should ideally be given within 24 hours of the first symptoms, as soon as possible after the laboratory specimens are taken. Since 1948, streptomycin has remained the treatment of choice for bubonic, septicemic, and pneumonic plague.
 - 4. Delaying therapy greatly decreases survival.
 - 5. In a mass casualty setting, parenteral therapy may not be possible; oral therapy, preferably with doxycycline (100 mg po BID) or ciprofloxacin (500 mg po BID), should be administered.

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6. If treated with antibiotics, buboes typically recede in 10 to 14 days and do not require drainage.

21. How Is Plague Spread?

- a. Several countries are known to have weaponized plague. Intentional spreading of the plague bacteria through the air is the most likely way *Yersinia pestis* would be used as a weapon. *Yersinia pestis* used in an aerosol attack would cause cases of the pneumonic form of plague. Once a population is infected, the disease could spread in respiratory droplets to close contacts (within 2 meters).
- b. Plague can be spread from person-to-person via respiratory secretions coughed into the air and inhaled by those nearby.

22. Containing an Outbreak of Plague

- a. Isolation Precautions for Plague
 1. All patients with plague should be isolated for the first 48 hours after the initiation of treatment. If patients have no pneumonia or draining lesions at 48 hours, they may be taken out of strict isolation.
 2. Hospital rooms should receive cleaning consistent with Standard Precautions; clothing and linens contaminated with the body fluids of plague patients should be washed in hot water with bleach. Special care must be taken in handling blood and bubo discharge.
 3. Bodies of patients who have died should be considered contagious and should not be handled except with gloves, gowns, and masks.
 4. Pneumonic plague: Patients with pneumonia must be isolated until they have completed at least 4 days of antibiotic therapy. Droplet Precautions should be used in addition to Standard Precautions. Healthcare providers and others wear a surgical-type mask when within 3 feet of the infected patient. Based on local policy, healthcare facilities routinely require a mask be worn to enter the room of a patient on Droplet Precautions.
- b. [Level 3 only]: Post-Exposure Prophylaxis
 1. Recommendations for prophylaxis are subject to change. Current recommendations are posted on the JAMA website [see Videx slide for URL]:
Adults-doxycycline (100 mg po bid) or ciprofloxacin (500mg po bid)
Pregnant women-doxycycline (100mg po bid) or ciprofloxacin (500 mg po bid)
Children-doxycycline (if ≥45 kg, give adult dosage; if <45 kg, give 2.2 mg/kg po bid) or ciprofloxacin (20 mg/kg po bid)

23. What Is Botulism?

- a. Botulism is the disease caused by any of seven distinct protein neurotoxins produced by the bacterium *C. botulinum*.
- b. These toxins are among the most potent toxins known and cause paralysis by blocking the transmission of nerve impulses between the central nervous system and the muscles.
- c. The toxins can cause respiratory failure by paralyzing the breathing muscles, resulting in death unless patients are placed on mechanical ventilators.

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- d. As a weapon, purified botulinum toxin could be released into the air as an aerosol to be inhaled by its intended victims or used as a food or water contaminant to be ingested by victims.
- e. [Level 3 only]: The hallmark signs of botulism include an acute, symmetric, descending, flaccid paralysis with prominent facial muscle weakness in an alert patient. Severity of illness varies depending on the degree of toxin exposure, ranging from minimal weakness to full paralysis.

24. *The Symptoms of Botulism*

- a. All forms of botulism share similar symptoms that are dominated by a toxin-induced blockade of the neurologic functions of the body. Severe cases can result in paralysis or even death.
- b. If untreated, these symptoms may progress to cause a symmetric flaccid paralysis progressively spreading downward to the arms, torso, and legs.
- c. [Level 3 only]: Presentation and Treatment of Botulism
 - 1. Regardless of route of exposure, the initial symptoms of botulism involve cranial nerve paralysis, which includes blurred or double vision (diplopia), ptosis, slurred speech, dryness of mouth, hoarseness, and difficulty swallowing. In mild cases, these may be the only symptoms. In more severe cases, patients experience a characteristic symmetrical, descending, progressive weakness of the extremities.
 - 2. The hallmark of botulism is an acute, symmetric, descending, flaccid paralysis with prominent facial muscle weakness in an alert patient.
 - 3. It is important to note that, with all forms of botulism, treatment with aminoglycoside (gentamicin or tobramycin) antibiotics may worsen the neuromuscular weakness of botulism. This treatment has been associated with an increased likelihood of the need for mechanical ventilation.
 - 4. Inhalational botulism would result from airborne dispersal of the botulinum toxin as a biological agent. Botulinum toxins delivered by aerosol would be expected to cause symptoms similar in most respects to those observed with food-borne botulism. Symptoms of inhalational botulism can begin as early as 24-36 hours, or as late as several days, following exposure.

25. *How Is Botulism Diagnosed?*

- a. The diagnosis of botulism is not difficult when the illness is strongly suspected, as in the setting of a large outbreak, but since cases of botulism most often occur singularly, the diagnosis may pose a more perplexing problem.
- b. [Level 3 only]: Diagnosis of Botulism
 - 1. Botulism should be suspected in any adult with a history of acute onset of gastrointestinal, autonomic (e.g., dry mouth, difficulty focusing), and cranial nerve (diplopia, dysarthria, dysphagia) dysfunction or in any infant with poor feeding, diminished sucking and crying ability, neck and peripheral muscle weakness, and/or ventilatory distress.
 - 2. Toxicity testing of serum specimens, culture of tissues debrided from a wound, and toxicity testing, plus culture of stool specimens or epidemiologically incriminated foods or both are the best methods for confirming the diagnosis of botulism.

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26. Treatment of Botulism

- a. The primary treatment of botulism is the administration of the botulinum antitoxin, which is most effective when administered within 24 hours of the onset of symptoms.
- b. [Level 3 only]:
 1. The Mainstays of Botulism Treatment
 - a. Administration of botulinum antitoxin in an attempt to prevent neurologic progression of a moderate, slowly progressive illness or to shorten the duration of ventilatory failure in those with a severe, rapidly progressive illness.
 - b. Careful monitoring of respiratory vital capacity and aggressive respiratory care.
 - c. Prolonged supportive care.
 2. Treatment and Diagnosis
 - a. The appropriate treatment of botulism cannot await the results of laboratory confirmation that may be long delayed and only confirmatory in some cases.
 - b. Diagnosis should be made on the basis of case history and physical findings.
 3. The value of decontamination in cases of botulism is uncertain.

27. What Is Tularemia?

- a. Tularemia, a bacterial zoonosis, is caused by *Francisella tularensis*, one of the most infectious pathogenic bacteria known. It requires inoculation or inhalation of as few as 10 organisms to cause disease.
- b. Like plague, tularemia is a disease of animals that may be transmitted to humans, hence its common names of "rabbit fever" and "deer tick fever."
- c. *F. tularensis* could be used as a biological weapon in a number of ways, but an aerosol release would likely have the greatest adverse medical and public health consequences as tularemia is particularly infectious by inhalation.
- c. [Level 3 only]: Airborne *F. tularensis* would be expected to principally cause pleuropneumonitis, but some exposures might contaminate the eye, resulting in ocular tularemia; penetrate broken skin, resulting in ulceroglandular or glandular disease; or cause oropharyngeal disease with cervical lymphadenitis.

28. The Symptoms of Tularemia

- a. In general, the onset of tularemia is usually abrupt, with fever (38°C-40°C), headache, chills and rigors, generalized body aches (often prominent in the low back), coryza, and sore throat.
- b. A pulse-temperature dissociation has been noted in as many as 42% of patients.
- c. A dry or slightly productive cough and substernal pain or tightness frequently occur with or without objective signs of pneumonia, such as purulent sputum, dyspnea, tachypnea, pleuritic pain, or hemoptysis.
- d. Nausea, vomiting, and diarrhea may also occur.
- e. Sweats, fever, chills, progressive weakness, malaise, anorexia, and weight loss characterize the continuing illness.

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f. [Level 3 only]: Tularemia Symptoms In-Depth

1. Primary clinical forms vary in severity and presentation according to virulence of the infecting organism, dose, and site of inoculum. The clinical presentations of naturally occurring tularemia include: ulceroglandular (regional lymph node involvement with skin ulcers), glandular (regional lymph node involvement without skin ulcers), oculoglandular (conjunctivitis with regional lymph node involvement), oropharyngeal, intestinal (abdominal pain, vomiting, and diarrhea), pneumonic (lung), and typhoidal (febrile illness without early localizing signs).
2. With the exception of typhoidal tularemia, the clinical syndromes are characterized by the combination of a focal process, often including a skin ulcer where the bacterium entered the skin, and involvement of the lymph nodes groups draining the portal of entry. These forms may overlap, and patients with any form may progress to more serious disease including sepsis.
3. Pneumonic and typhoidal tularemia are the most serious forms of the disease and are the forms most likely to result from the aerosolized deployment of *F. tularensis* as a biological weapon. Beginning 3-5 days after inhalation, patients with inhalational tularemia typically experience the abrupt onset of a nonspecific illness with symptoms of fever, chills, headache, body aches, and a dry or minimally productive cough. Nasal discharge and sore throat may be present and nausea, vomiting, and diarrhea may also occur. Over the next several days patients go on to develop either: (1) pneumonic tularemia with shortness of breath, rapid breathing, bloody purulent sputum (frank hemoptysis is uncommon), and pleuritic chest pain or (2) typhoidal tularemia, a progressive systemic illness without overt localizing infection.
4. In general, tularemia would be expected to have a slower progression of illness and a lower case-fatality rate than either inhalational plague or anthrax.

29. *How Is Tularemia Diagnosed?*

- a. The diagnosis of tularemia can be suspected on the basis of clinical presentation but the manifestations of the various forms of disease are not adequately specific to make a firm diagnosis.
- b. Routine laboratory testing and radiographs are also non-specific. Depending on the presentation, the differential diagnosis may include plague (bubonic and/or pneumonic) and anthrax (cutaneous and/or inhalational).
- c. [Level 3 only]: When the diagnosis is uncertain, antibiotic therapy appropriate for brucellosis, plague, and anthrax should be started immediately (e.g., doxycycline 100 mg twice a day for 14 days). Growth of *F. tularensis* in culture is the definitive means of confirming the diagnosis of tularemia.

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30. *Treatment of Tularemia*

- a. There is effective antibiotic therapy for tularemia. Multiple antibiotics have been used successfully.
- b. Effective supportive care is crucial; intensive care (including ventilatory support) may be needed. All open lesions should be covered and topical antibiotics applied.
- c. Isolation is not recommended for tularemia patients, given the lack of person-to-person transmission. In hospitals, Standard Precautions are recommended.
- d. [Level 3 only]: Recommended Tularemia Treatment
 1. Treatment
 - a. Effective antibiotics for tularemia include streptomycin, gentamicin, chloramphenicol, tetracyclines, and fluoroquinolones (e.g., ciprofloxacin).
 - b. In a contained casualty setting where individual patient management is possible, parenteral antimicrobial therapy is recommended.
 - c. In a mass casualty setting, orally administered doxycycline and ciprofloxacin are the preferred choices for treatment of tularemia in both adults and children.
 2. Post-Exposure Prophylaxis
 - a. Following an aerosol release, exposed persons should be treated prophylactically (i.e. to prevent developing the disease).
 3. Infection Control
 - a. Standard Precautions should be used with tularemia patients.
 - b. Bodies of patients who die of tularemia should be handled using standard precautions. Autopsy procedures likely to produce aerosols or droplets should be avoided.
 - c. Clothing or linens contaminated with body fluids of patients with tularemia should be disinfected per standard hospital procedure.

31. *What Are the Viral Hemorrhagic Fevers?*

- a. Viral hemorrhagic fevers (VHFs) are a group of illnesses characterized by bleeding and fever and caused by several distinct families of viruses.
- b. In general, the term "viral hemorrhagic fever" is used to describe a severe, multi-system syndrome (multi-system in that multiple organ systems in the body are affected).
- c. Characteristically, the overall vascular system is damaged, and the body's ability to regulate itself is impaired. These syndromes are often accompanied by hemorrhage, although the bleeding is itself rarely life-threatening.
- d. While some types of hemorrhagic fever viruses can cause relatively mild illnesses, many of these viruses cause severe, life-threatening disease.
- e. All of the VHFs, with the exception of dengue, are potentially transmitted via aerosol. This capability, combined with their ability to cause serious illness has resulted in their consideration as biological weapons.
- f. Some examples of the VHFs include Ebola hemorrhagic fever and Hantavirus pulmonary syndrome.

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g. [Level 3 only]: VHFs In-Depth

1. Viruses associated with most VHFs are zoonotic, which means that viruses naturally reside in an animal reservoir host or arthropod vector and are totally dependent on their hosts for replication and overall survival.
2. Taken together, the viruses that cause VHFs are distributed over much of the globe. However, because each virus is associated with one or more particular host species, the virus and the disease it causes are usually seen only where the host species lives.
3. While people usually become infected only in areas where the host lives, occasionally people become infected by a host that has been exported from its native habitat.

32. *Symptoms of the Viral Hemorrhagic Fevers*

- a. The hemorrhagic fever viruses vary in incubation period and in their ability to cause severe disease but initial signs and symptoms are often similar and include fever, flushing, red eyes, muscle aches, dizziness, and fatigue.
- b. Patients with VHFs may show signs of bleeding into the skin (petechiae, purpura, ecchymoses), and, in more severe cases, of bleeding in internal organs or from mucosal surfaces (the mouth, eyes, and ears). Although patients may bleed from many sites, they rarely die as a result of blood loss.
- c. Severely ill VHF patients may also show delirium, seizures, and coma. The most dreaded complications of VHFs are shock, multiple organ system failure, and death.
- d. Specific signs and symptoms vary by the type of VHF.

33. *Diagnosing the Viral Hemorrhagic Fevers*

- a. Although the diagnosis of a viral hemorrhagic fever (VHF) can be suspected on the basis of clinical presentation, many other diseases can present similarly.
- b. Routine laboratory findings are also nonspecific and variable.
- c. In general, VHFs result in decreased numbers of platelets and white blood cells. Levels of liver enzymes and creatinine may be elevated.
- d. Until the diagnosis has been definitively established via specialized laboratory testing, all patients whose presentation suggests a VHF should be isolated and medical providers should use maximal protective precautions. Care providers must always wear protective equipment when handling specimens from suspected VHF cases

34. *Treatment of the Viral Hemorrhagic Fevers*

- a. There are no effective antiviral medications for most of the viral hemorrhagic fevers (VHFs). The exception is the antiviral ribavirin, which has been effective in treating certain VHFs.
- b. For the most part, optimal treatment consists of providing aggressive supportive care in a hospital intensive care unit. Special attention must be paid to fluid and electrolyte balance, and to the treatment of shock, blood loss, renal failure, seizures, and coma.
- c. [Level 3 only]: Antiviral ribavirin has been effective in treating some individuals with Crimean Congo HF, Lassa fever, RVF, and HFRS and may also be effective in treating Hendra virus disease and Nipah virus encephalitis.

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35. Containing a Viral Hemorrhagic Fever Outbreak

- a. A viral hemorrhagic fever outbreak can challenge the resources of caregivers for the following reasons:
 - Vaccines only exist for two of the viruses (yellow fever and Argentine hemorrhagic fever).
 - Only Crimean-Congo VHF (CCVHF) and Lassa fever have effective post-exposure prophylaxis (i.e., ribavirin 500 mg po q6h x 7 days).
 - The risk of person-to-person spread varies by virus, so it is useful to learn the identity of the virus causing the outbreak. Maximum precautions should be taken.
- b. There is no known risk of transmission of VHFs from infected individuals to casual contacts.
- c. Standard Precautions always should be used with suspected or confirmed VHF patients.
- d. [Level 3 only]: A VHF diagnostic algorithm exists, and can be found in the accompanying Videx Slide in the CD-ROM or on the CDC website. If there are more than 2 suspected VHF patients, you need to take steps immediately to adapt the VHF Isolation Precautions (either droplet or airborne, depending on transmission) for a large number of patients.

36. What Is Brucellosis? [Instructor suggestion: You may want to provide an example of a CDC Category B agent, and can discuss brucellosis and /or ricin.]

- a. Brucellosis is an infectious disease caused by the bacteria of the genus *Brucella*. Human brucellosis can cause symptoms similar to the flu. Severe infection of the central nervous systems or endocarditis can occur.
- b. The disease is not communicable from person-to-person.
- b. [Level 3 only]: A definitive diagnosis of brucellosis is made by culturing the organism from blood, bone marrow, or other clinical specimens. Antibiotics can reduce the severity and duration of the illness, although most patients will recover without treatment.

37. What Is Ricin?

- a. Ricin is a potent protein toxin derived from the waste left over from the processing of castor beans to make castor oil.
- b. Ricin inhibits protein synthesis, resulting in cell death.
- c. Ricin has been involved in assassinations and assassination attempts, as well as other criminal incidents worldwide.
- d. [Level 3 only]: Ricin In-Depth
 - 1. Ricin has weapon potential because of its highly toxic effect, the worldwide availability of the castor bean, and the stability of ricin in the environment.
 - 2. Depending on route of exposure, as little as 70 micrograms of ricin could be enough to kill an adult.
 - 3. Specific effects of ricin poisoning depend on whether ricin is inhaled, swallowed, or injected, as well as the dose administered. In animal models, the inhalational route was the most toxic.
 - 4. Symptoms of cough, chest tightness, difficulty breathing, nausea, and muscle aches develop within a few hours of inhaling significant amounts of ricin.

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5. Treatment: Soap and water provide adequate skin decontamination of ricin. Oral activated charcoal and cathartics may be useful if administered soon after ingestion. There are no antidotes to the ricin toxin. Treatment is supportive, including respiratory support for inhalational intoxication.

C. Radiation

1. What Is Radiation?

- a. [Level 3 only]: Radioactive material consists of atoms with unstable nuclei. As unstable nuclei decay to more stable forms, they emit radiation. This process often involves the ejection of charged particles from the atomic nuclei. The ejection of particles (e.g., alpha or beta particles) often is accompanied by the emission of gamma rays from the nucleus or x-rays from the atom's outer shells. Sometimes the new atom is also unstable and will, in turn, decay. This process is known as a decay chain. Beta particles, alpha particles, gamma rays, and x-rays are all forms of radiation that can come from radioactive atoms.
- b. Radioactive fallout is the descent of minute particles of radioactive debris, such as dust particles, in the atmosphere following a nuclear explosion.

2. What Are Sources of Radiation?

- a. The average person is exposed to approximately 1/3 of a rem unit of radiation annually. This amount of radiation has no known measurable health effect. Approximately 80% of this exposure is thought to result from naturally occurring sources, with the remaining 20% resulting from human-made sources.
- b. There have been over 400 radiation accidents with significant human radiation exposures worldwide. Many of the associated radiation related fatalities have been the result of nuclear power plant accidents.
- c. [Level 3 only]: Chernobyl
 - 1. In 1986, the worst radiation accident to date took place at the Chernobyl nuclear power plant.
 - 2. Approximately 3,200 workers handled highly radioactive material during the emergency response phase of operations. At least 203 people were hospitalized immediately following the accident. There were 30 fatal cases of acute radiation illness. Millions of people were exposed to radioactive contamination from the ensuing radioactive fallout.
 - 3. The only long-term health effect that has been documented to date is an increase in thyroid cancer in children. However, it is expected that there will be an increase in cancer mortality among the Chernobyl workers.

3. What Is Radioactive Half-Life?

- a. In any sample of radioactive material, the amount of radioactive material (i.e., number of unstable atoms) constantly decreases with time because of radioactive decay. The half-life describes how quickly radioactive material decays with time.
- b. The radioactive half-life is the time required for the number of unstable atoms of a radioactive substance to decrease by one half.

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c. [Level 3 only]: Half-Lives

1. Half-lives range from fractions of a second to trillions of years:

- Uranium has a half-life of billions of years.
- Cesium-137 has a half-life of 30 years.
- Iodine 131 has a half-life of 8 days.
- Technetium-99 has a half-life of 6 hours.

4. Radiation Detection

- a. Humans cannot see, smell, taste, feel, or hear radiation, but instrumentation exists to detect it at very low levels.
- b. Radiation monitoring instruments can detect the presence of radioactive contamination.
- c. In the event of a suspected high-level radiation exposure, the Hospital Radiation or Hospital Safety Officer needs to be called in to evaluate the situation.
- d. [Level 3 only]:
 1. Examples of radiation detection devices include Geiger-Mueller survey meters, ionization chambers, and personal dosimeters. Geiger-Mueller (GM) survey meters, also known as Geiger counters, are used to quickly determine if a person is contaminated.
 2. Direct radiation measurements include using whole body radiation counters, chest counters, thyroid scanners, and wound monitoring instrumentation. Indirect measurements, known as bioassays, involve blood, fecal, and urine sampling. A health physicist can use this information to determine the lifetime probability of radiation-induced disease in an exposed patient.

5. Types of Radiation

- a. Radiation is classified into two basic categories: non-ionizing and ionizing radiation.
- b. Non-ionizing radiation is low energy and typically harmless in most situations. Examples of non-ionizing radiation are light rays, radio waves, and microwaves.
- c. Ionizing radiation (such as alpha particles, beta particles, and gamma rays) is capable of imparting harmful energy to the body and damaging the body's cells. Sources of ionizing radiation include natural radiation from the earth and outer space; radioactive materials used in industry and medicine; nuclear reactor accidents; and radiation dispersal devices, such as dirty bombs.
- d. Ionizing radiation is responsible for many of the more severe health effects of radiation exposure, such as acute radiation syndrome.

6. How Is Radiation Exposure Measured?

- a. Radiation energy that is deposited into our bodies is called a dose of radiation. The higher the dose of absorbed radiation, the more radiation energy is deposited in our body. Rem units are commonly used to describe doses of radiation absorbed by the body.

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- b. [Level 3 only]: Radiation Exposure and Measurements
 - 1. In addition to the type of radiation, three primary factors influence radiation exposure: Time, Distance, and Shielding.
 - 2. Radiation causes damage based on the type and amount of radiation; time of exposure; distance from source of exposure; amount and type of protective shielding; and whether the exposure was continuous or intermittent.
 - 3. Radiation may be quantified by several methods. These include: energy exposure (roentgen); absorbed dose (rad); amount of radiation absorbed standardized by the potential for biological damage (rem); and atomic transformations per unit time (curie).

7. *What Is Radioactive Contamination?*

- a. Exposure to radiation does not make an individual radioactive. X-rays are a good example of exposure to radiation that does not generate enough energy to have any demonstrable effects.
- b. Radioactive contamination results from radioactive materials landing on the skin (in the case of external contamination) or penetrating the body (in the case of internal contamination). When people are contaminated with radioactive material, they continue to receive radiation exposure from the material, a process called irradiation. In these cases, people can spread the contamination to their surrounding environment.
- c. [Level 3 only]: Individuals can become externally and/or internally contaminated by radiation. If externally contaminated patients do not decontaminate, they can secondarily contaminate care providers and others. In general, internally contaminated patients do not pose radiation-related health risks to their surrounding environments.

8. *Nuclear Weapons Overview* [Optional for Levels 2 and 3]

- a. Nuclear weapon explosions have devastating effects. Nuclear energy is derived from the processes of fission and fusion of atomic nuclei. Tremendous amounts of energy are released as a result of these processes.
- b. The immediate health effects of nuclear weapon detonation include blast injuries and burn injuries in the area of detonation.
- c. Radioactive fallout leads to radioactive materials contaminating the air and environment surrounding the detonation site. Such contamination can cause long-term problems because it affects soil, water, and surface vegetation.

9. *Nuclear Weapons Damage Predictions* [Optional for Levels 2 and 3]

- a. Immediate deaths from nuclear weapon explosions are caused by blast effects and burn injuries. With larger yield weapons, defined as those over 50 kilotons (KT), blast and burn effects are so severe that immediate radiation effects are of secondary concern.

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10. What Is a Dirty Bomb?

- a. A dirty bomb is a radioactive material dispersion device consisting of a conventional explosive, such as dynamite, attached to radioactive material. It is different from a nuclear weapon.
- b. The detonation of a dirty bomb results in immediate damage from the explosion itself and the dispersion of radioactive materials into the surrounding environment.
- c. Although contamination can be spread over several square kilometers, there is very little chance of radiation injury outside the immediate blast area.

11. What to Do after Radiation Explosions

- a. The three safety principles to follow after radiation explosions are:
 - 1. Leave the area of the explosion.
 - 2. Remove your clothes once you have left the explosion site.
 - 3. Thoroughly wash with mild soap and water.
- b. **Remember:** Radioactive materials can enter the body via the mouth and nose. Do not eat, drink, or smoke in a contaminated area. Masks or wet cloths held over the mouth and nose minimize the inhalation of radioactive materials.

12. What Is Depleted Uranium? [Optional for Levels 2 and 3]

- a. Depleted uranium is a weakly radioactive form of uranium that is some 1.7 times denser than lead.
- b. The use of DU as tank armor and in military munitions by many countries has raised concerns regarding possible related health effects in areas of military conflict.
- c. Typical civilian levels of exposure to DU do not appear to pose any health risks. The health effects of high dose and prolonged DU exposure are more difficult to predict.
- d. The military acknowledges that the inhalation of dust created when DU weapons strike their target could cause adverse health effects. Individuals should avoid prolonged durations of contact with DU-contaminated environments.

13. How Does Radiation Harm You?

- a. Radiation exerts its harmful effects by damaging or causing the death of human cells.
- b. The short-term effects of high-level radiation develop over days to weeks.
- c. The long-term effects are the result of damage to DNA, the basic building blocks of the human body. Long-term effects include an increased risk of cancer (such as thyroid cancer), fertility problems, and birth defects. Many of the early effects of radiation exposure are predictable, while most late effects are not.
- d. [Level 3 only]: Radiation In-Depth
 - 1. Higher doses of radiation result in more severe damage and a shorter time until the appearance of clinical symptoms. Most patients receiving similar doses will exhibit similar effects.
 - 2. Radiation damage includes skin damage, bone marrow depression, intestinal damage, cardiovascular, and nervous system failure. Long-term effects of radiation exposure (e.g., increased risk of cancer development) occur months to years later. Long-term radiation damage also includes the potential for hereditary effects.

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The risk of cancer increases as radiation doses increase. Fortunately, radiation is a relatively weak cancer-causing agent.

3. It is difficult, if not impossible, to predict long-term effects of radiation at time of exposure.

14. *Radiation's Effect on Children and the Elderly*

a. Growing children and the elderly are generally more sensitive to ionizing radiation than young to middle-aged adults as a result of the respective developmental states of their cells.

b. Children comprise the most sensitive age group.

c. [Level 3 only]

1. The Elderly: Due to their less efficient cell repair mechanisms, the elderly are more sensitive than younger adults to diseases associated with free radicals, of which radiation is a source.

2. Children: Children are more sensitive to radiation than adults because they are growing more rapidly, there are more cells dividing in their bodies, and consequently, there is a greater opportunity for radiation to disrupt the process.

3. Fetus/Embryo: Radiation damage to the fetus depends on the dose and type of radiation and the sensitivities of the various organ systems during exposure.

15. *Radiation and Pregnancy*

a. Risks to an unborn child vary with the age of the fetus and with the type, severity, and length of exposure.

b. Risks to a fetus include: acute radiation syndrome, increased lifetime risk of developing cancer, brain damage resulting in mental retardation, congenital deformities, and growth retardation.

16. *Acute Radiation Syndrome*

a. Acute radiation syndrome (ARS) refers to a sequence of body organ injuries that occur following exposure of the whole body to high doses of penetrating radiation exposure.

b. Early symptoms of ARS include nausea, vomiting, and diarrhea. Concurrently, damage to blood cells and bone marrow causes depressed immunity and increased tendency for bleeding. Death is often the result of infection and multiple organ failure.

c. There is no specific treatment or antidote for acute radiation syndrome.

d. [Level 3 only]: Overview of ARS Treatment

1. Treatment: The treatment of all radiation exposure patients involves immediately removing them from any significant ongoing source of radiation and then decontaminating them if necessary. There may be a delay of hours to days before a patient develops any overt symptoms of ARS. Once ARS develops, the treatment follows many of the principles used in caring for burn victims and chemotherapy patients. Treatments include providing intravenous hydration and nutrition, protecting patients from infection, and restoring depleted blood cell lines.

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17. Treatment of Acute Radiation Syndrome

- a. As with all types of radiation injuries, the first priorities in treating acute radiation syndrome (ARS) are immediate removal of patients from ongoing high-level exposure to the radiation source, stabilization, and decontamination.
- b. There may be a delay of hours to days before patients with ARS develop any obvious symptoms.
- c. Once illness develops, ongoing treatment follows many of the principles used in caring for burn victims and chemotherapy patients. Attention is given to providing pain control, providing intravenous hydration and nutrition, protecting patients from infection, and restoring depleted blood cell lines by transfusions.

d. [Level 3 only]: Diagnosis and Treatment of ARS:

1. The diagnosis of ARS can be difficult to make because ARS causes no unique disease. The prodromal gastrointestinal symptoms generally do not last longer than 24-48 hours after exposure, but a vague weakness and fatigue can persist for an undetermined length of time. The time of onset,

severity, and duration of these signs are dose dependent and dose-rate dependent. These factors can be considered in conjunction with white blood cell differential counts to determine the presence and severity of the acute radiation syndrome.

2. Both the rate and degree of decrease in blood cells are dose dependent. A useful rule of thumb: If lymphocytes have decreased by 50% and are less than $1 \times 10^9 / l$ (1000/ μl) within 24 to 48 hours, the patient has received at least a moderate dose of radiation. In combined injuries, lymphocytes may be an unreliable indicator. Patients with severe burns and/or trauma to more than one system often develop lymphopenia. These injuries should be assessed by standard procedures, keeping in mind that the signs and symptoms of tissue injuries can mimic and obscure those caused by acute radiation effects.

3. If a patient is known or suspected of having been exposed to a large radiation dose (more than .05 Gy [5 rads]), draw blood for CBC analysis, with special attention to the lymphocyte count, every 2 to 3 hours for the first 8 to 12 hours following exposure (and every 4 to 6 hours for the following 2 days). Observe the patient during this time for symptoms and consult with radiation experts before ruling out ARS.

18. Decontamination

- a. Radioactive contamination results from coming into contact with radioactive material.
- b. Patients contaminated with radioactive material continue to receive radiation from the material and, unless decontaminated, can spread contaminants to their surrounding environment.
- c. External radioactive contamination can be thought of as getting covered in dust or dirt. External decontamination requires the removal of all radioactive particles from the body.
- d. Removing the patient's clothing and washing exposed skin surfaces will eliminate more than 90% of the contamination.
- e. Utilizing warm water and soap is the most practical and effective way to remove the radioactive particles.

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- f. Care providers must establish decontamination zones and wear face masks, shoe covers, gloves, and gowns to prevent secondary contamination.

19. Internal Contamination Treatment

- a. When radioactive material enters the body, it can be difficult to remove. Radioactive material can enter through wounds, inhalation, or swallowing.
- b. Certain interventions may assist in removing or improving the body's ability to rid itself of these radioactive materials. These treatments are complex and require assistance from radiation health experts.
- c. [Level 3 only]: Treatment Protocol
 - 1. The routes for internal contamination involve skin absorption, wound contamination (as with radioactive shrapnel), inhalation, and ingestion.
 - 2. Specific medications are available that will bond with radionuclides and mitigate their effects (e.g., Prussian blue for radioactive cesium and thallium). Blocking agents (e.g., potassium iodide) need to be administered prior to, or shortly after, radioactive iodine exposure to be effective.

Many of these treatments are complex and require assistance from radiation health experts.

- 3. If internal contamination is suspected or has occurred, the physician or radiation safety officer should request samples of urine, feces, vomitus, wound secretion, etc. Whole-body counting and radioassay can help evaluate the magnitude of the problem and the effect of any treatment. The contaminated patient admitted with an airway or endotracheal tube must be considered to be internally contaminated.

20. Use of Potassium Iodide

- a. Nuclear reactors contain large amounts of radioactive iodine, a substance not generally found in other sources of radiation. This radioactive iodine can be widely dispersed into the air following accidents involving a leakage of nuclear products.
- b. The United States' Food and Drug Administration recommends administering potassium iodide (KI) as soon as a radioactive cloud containing iodine from an explosion approaches. Potassium iodide still will have a protective effect if taken several hours following exposure.
- c. The 1986 Chernobyl nuclear plant accident was an example of such a scenario.
- d. Children are the most susceptible to the dangerous effects of radioactive iodine.
- e. [Level 3 only]
 - 1. Potassium iodide does not protect people against all forms of radiation. It only protects the thyroid gland from the deleterious effects of radioactive iodine. Potassium iodide has no protective value against a dirty bomb or the dispersion of spent nuclear fuel.

21. Treatment Priorities

- a. There are three basic treatment priorities for radiation contamination:
 - 1. Life threatening injury stabilization takes priority over decontamination.
 - 2. Rapid and thorough patient decontamination.
 - 3. Save, label, and safely store contaminated materials for future analysis, particularly if a crime or an act of terrorism is suspected.

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- b. The critical point in management of radiation injuries is to treat conventional injuries first (e.g., burns and blast injuries). Survivable radiation injury is not life threatening in the first few hours following exposure.
- c. Standard Precautions (i.e., face mask, shoe covers, gloves, gown, and eye protection) will protect care providers against secondary contamination if a victim is covered with radioactive material.

22. *Psychological Effects of Radiation Exposure*

- a. An event that exposes people to harmful levels of radiation will likely cause psychological trauma.
- b. Initial psychological effects often are evident in panic and shock.
- c. Depression, anxiety, sleeping disorders, and other psychological changes in individuals likely will be evident in the time following an event.
- d. Data from the former Soviet Union nuclear plant accidents as well as the Three Mile Island accident in the United States reveal significant psychological animosity in the affected population. Poor information-sharing by public officials, authoritarian protection measures, and a lack of confidence in public officials are factors that can worsen public fears.
- e. First responders and hospital staff can help offset the psychological trauma of radiation exposure by providing high-quality, well-organized patient care.

D. Explosives

1. *What Happens in an Explosion?*

- a. During an explosion, gasses under extremely high pressures are produced. When these gasses expand, they form a blast wave, which spreads out in all directions.
- b. The magnitude and duration of the blast wave are major determinants of the severity of a blast injury.
- c. [Level 3 only]: Blast Waves
 - 1. The duration and magnitude of the blast wave's peak may depend on a host of factors, including the type of explosive used, the conducting medium, and distance from the detonation site.
 - 2. The duration and magnitude of the peak of the blast wave's pressure also determine the overpressure that an object in its path is subjected to and constitute the main determinants of the severity of primary blast injury.

2. *Types of Explosives*

- a. There are two basic types of explosives: low-order and high-order.
- b. Low-order explosives do not cause blast wave formation, and include black powder and petroleum (gasoline or jet fuel) based bombs.
- c. High-order explosives generate a reaction that results in the creation of a blast wave, the main culprit of primary blast injury. These include TNT, dynamite, and composition C4.

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3. *The Four Types of Blast Injury* [Instructor: Show table in the slide and discuss.]

- a. Blast injuries are categorized into primary through quaternary types of injury.
- b. Each type has its own mechanism of injury, as displayed in the table on the CD-ROM.

4. *Primary Blast Injury*

- a. As a blast wave impacts the body, a pressure wave is transmitted through the body surface, affecting the underlying tissues.
- b. This transmitted wave may fragment tissues of different densities, compress air-filled organs, or tear organs from their points of fixation.
- c. [Level 3 only]: Primary Blast Injury In-Depth
 1. Most of the clinical syndromes resulting from primary blast injury are direct results of the "blast wave," or overpressure, created by an explosion.
 2. As the blast wave impacts the human body, extreme pressure differentials are generated at point of impact at the body surface area. This pressure differential subsequently accounts for a tremendous external force acting on the body surface, in turn creating a "stress wave" that is transmitted to the underlying tissues. A combination of stress and shear waves is produced by this process, and these affect mostly gas-containing organ systems, such as the lungs, the bowel and middle ear.
NOTE: This lecture focuses on primary blast injury, but the other mechanisms are discussed in the slides on secondary through quaternary blast injury as well.

5. *Blast Lung*

- a. When a blast wave impacts the lung, the lung tissue is compressed faster than the air within it. As a result, the lung tissue may bruise or bleed.
- b. Bruising within the lung may be widespread, or it can assume a characteristic "butterfly pattern."
- c. [Level 3 only]: Blast Lung In-Depth
 1. Primary blast injury of the lung, or blast lung injury, primarily presents as pulmonary contusions (similar to pulmonary contusions from blunt trauma, but without the rib fractures), impairing gas exchange at the alveolar level and resulting in decreased oxygen diffusion.
 2. Higher magnitude blast waves can cause significant lung injury, which may result in pneumothorax, hemothorax, alveolovenous fistulas and traumatic emphysema. Complications of such injuries include bronchopleural fistulas and arterial air embolism.

6. *Management of Blast Lung*

- a. All patients with suspected blast lung injury should be given the highest available fraction of inspired oxygen (FiO_2) possible, preferably by non-rebreather facemask (NRFM). The recommendations for treatment of blast lung injury are prevention of intubation and positive-pressure ventilation.
- b. [Level 3 only]: Mechanical Ventilation
 1. One of the most difficult issues to contend with in blast lung injury is the initiation of mechanical ventilation.
 2. The recommendations for treatment of blast lung injury are *prevention* of intubation and positive-pressure ventilation.

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3. Acute air embolism (AAE) is one of the major complications seen with mechanical ventilation of blast-injured lungs, and its incidence can be decreased if spontaneous respirations are maintained.
4. All patients with suspected blast lung injury should receive the highest available fraction of inspired oxygen (FiO_2) possible, preferably by non-rebreather facemask (NRFM).
5. In spite of the risks, mechanical ventilation should not be withheld in cases of respiratory insufficiency. When positive pressure ventilation is used, parameters for tidal volume, respiratory rate and inspiratory flow rate should be chosen so as to minimize the peak airway pressure during the machine delivered breaths. Pressure controlled ventilation and permissive hypercapnia, to facilitate oxygen exchange but keep transalveolar pressures less than 35 cm H_2O , have been recommended.

7. *Eye and Facial Injuries*

- a. Likely because of the uniform density of the eye, ocular injury from a blast wave is rare.
- b. In rare cases, blast victims may experience transient blindness after exposure, as well as hyphema and conjunctival hemorrhage.
- c. Perforation and other ocular trauma are much more likely to be due to flying debris.

8. *Ear, Nose, and Throat Injuries*

- a. Perforation of the eardrum is the most common ear injury seen after an explosion. Most perforations tend to heal spontaneously. More significant blasts can damage the inner parts of the ear.
- b. It is common that persons injured in a blast will have hearing damage or deficits. This must be kept in mind as you are triaging, assessing, and giving patient direction.

9. *Treatment of Ear, Nose, and Throat Injuries*

- a. Tympanic membrane rupture is by far the most common aural injury, and barring infection, the vast majority of ruptures will heal without intervention.
- b. Sensorineural hearing loss usually resolves within the first few hours, but some degree of permanent hearing loss may occur in up to a third of blast victims.

10. *Abdominal Injuries*

- a. Injury to the abdomen is more commonly noted in the gas containing organs, such as small and large intestine, than solid organs, such as liver, spleen, and kidney. Small injuries to the bowel can progress with time resulting in perforations in the bowel.
- b. [Level 3 only]: Abdominal Injuries In-Depth
 1. The characteristics of blast injury in the abdominal cavity resemble those of blast injury in the thoracic cavity.
 2. The blast wave strikes and displaces the body wall, causing distortion of the tissues, which results in their stress and failure. Although no external injury is seen on the body wall, tissues containing air are especially vulnerable.

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11. *Management of Abdominal Injuries*

- a. Patients with abdominal injuries may have an unimpressive clinical picture initially, but may develop signs of severe abdominal injury hours to days after a blast.
- b. [Level 3 only]
 - 1. Presentation of Abdominal Injuries
 - a. Patients with primary blast injury to the GI tract may complain of abdominal pain, nausea, testicular pain, tenesmus, or a temporary loss of motor control in the legs.
 - b. Patients with an unimpressive physical examination initially may develop peritonitis hours or days later, when intestinal perforation has occurred.
 - 2. Evaluation and Management of GI Tract Injury
 - a. Focused abdominal sonography for trauma (FAST) should be used when available, and is especially useful in mass casualty incidents.
 - b. Stable patients may be amenable to further diagnostic imaging with computed tomography of the abdomen and pelvis, though this technique may not identify all intra-abdominal free air or bowel injury.
 - c. In unstable patients, a diagnostic peritoneal lavage (DPL) may play a role in the diagnosis of intra-abdominal hemorrhage. A major disadvantage of DPL is its insensitivity to retroperitoneal hemorrhage and mesenteric hematomas.

12. *Blast Injury Patient Disposition*

- a. Observation, admission, and discharge of patients with blast injury depend to a large extent on patient complaints and injuries.
- b. Patients with complaints of shortness of breath or chest pain should be observed in the emergency department for a prolonged period of time prior to discharge.
- c. Patients with abdominal pain and tenderness should be admitted to the hospital for inpatient observations.
- d. Patients with isolated tympanic membrane rupture can be discharged home with ENT follow up.

E. Unknown Threats

1. *Detecting an Outbreak of a Disease*

- a. Medical care providers should be alert to illness patterns and diagnostic clues that might indicate an unusual infectious disease outbreak associated with intentional release of a biologic agent, or symptoms and signs suggestive of chemical agent exposures.
- b. Basic knowledge of the potential delivery systems for chemical and biological attacks can allow detection. Conventional bombs, rockets, missiles, aircraft bombs, and spray devices can be used to deliver chemical and biological agents. In addition, water and food supplies may be contaminated.

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c. Chemical or Biological Weapons Questions: A **yes** to any of the following questions should raise the suspicion of a chemical or biological weapon attack and the event should be reported through appropriate channels:

- Was there spraying activity in an inappropriate area?
- Was there smoke or detectable material in the air?
- Did a bomb "pop" rather than explode?
- Was delivery of weaponized material witnessed?
- Are animals in the region ill or dead?
- Were the effects on humans immediate?
- Are individuals of all ages nearly equally affected?
- Was the attack rate higher among individuals outdoors and lower among those indoors?
- Is there a high fatality rate or unexpectedly high morbidity rate?
- Do the symptoms fail to fit the pattern of an endemic disease?
- Was there an unexplained odor inappropriate for the context of its surroundings?
- Was there an unexplained deposit of material in an area where casualties occurred (e.g. liquid droplets in absence of watering or rain)?

d. Biological Agents: The detection of biological agent outbreaks will have to be based on sound epidemiological surveillance principles. Indications of intentional release of biological agent release include:

- A rapid, large outbreak of similar disease in a discrete population.
- Many cases of unexplained deaths.
- More severe disease than expected for a given pathogen.
- A disease that is unusual for its geographic location.
- An unusual manifestation of a disease (e.g., anthrax presenting as pneumonia, or a particularly severe diarrheal disease outbreak).
- A single case of an unusual disease (e.g., smallpox case).
- A large number of ill or dead animals.

2. An Approach to the Unknown Threat

[Note to Instructors: The algorithm should be explained to Levels 2 and 3, who might want to view the algorithm on screen and/or on paper. We recommend that facilities print the algorithm to make it available in emergency departments or other emergency operations areas.]

a. The Purpose of the Approach to the Unknown Threat Algorithm

1. If there is a chemical, biological, or radiological exposure, care providers are not likely to know which agent was used. This lack of knowledge is particularly true in the early stages of an event, when people first begin to become ill. Since many agents are likely to be used covertly, it may not be known that an attack has occurred until many people have fallen ill.
2. The algorithm on the CD-ROM aims to allow identification of the causative agent of an outbreak of illness sufficiently to provide appropriate treatment and thereby limit morbidity and mortality; and to take measures to contain the outbreak.

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b. Agent Exposures

1. Many chemical agent exposures result in symptoms immediately, creating awareness of the exposure and often allowing identification of the class of agent used.
2. In contrast, most biological agent exposures do not result in immediate symptoms, so exposures are unlikely to be identified until people become ill later.

c. Symptoms-Based Approach

1. Once symptoms have developed, the algorithm helps with agent identification based on patients' predominant symptoms as follows:

- Seizure or focal neurological abnormalities
- Cough or trouble breathing
- Diarrhea and/or vomiting
- Rash or other skin signs

d. Who Can Use the Algorithm?

1. The algorithm is intended for use by medical facility staff operating in hospital or clinic settings.
2. It is based on the assumption the staff is faced with a large event and that they have limited, local resources.
3. Prior expertise in the CBRNE threats and the diseases they cause is not required.
4. The algorithm is based entirely on a brief history and visual inspection of the patient. Laboratory tests and radiographs are not necessary.

II. SAFETY

A. First Responders

1. Activating First Responders

- a. Local fire departments, law enforcement personnel, hazardous materials (Hazmat) teams, and Emergency Medical Services are among the first to respond to most disasters.
- b. Local law enforcement and fire services work together to secure areas and establish zones, organize a system for traffic control, and to determine whether or not evacuation measures are needed. These units also ensure legal compliance, promote evidence preservation, and restrict access to the site.
- c. The highest-ranking official of the first service unit to arrive at the scene will assume the role of Incident Commander.

2. Safety and Security

- a. There are three key safety considerations for first responders:
 1. Possibility for Secondary Attacks
 2. Evacuation
 3. Securing the Area

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3. Assessing the Event

- a. The incident Commander or crew member assigned by the Commander does a quick "hot lap" or "walk through" to gather information on the severity of the situation, including:
 1. Number of patients, including the "walking wounded"
 2. Scene hazards
 3. Apparent patient priorities and need for extrication
 4. Need for decontamination
 5. Number of ambulances and other resources needed
 6. Areas to stage resources
- b. All information gathered in the initial assessment is relayed by the Incident Commander to the dispatcher and/or Communications Center.

4. Contamination Control Zones [Instructor option: Show image in slide.]

- a. There are three main control zones established when the first team arrives on the scene:
 1. **Hot / Contamination Zone:** The Hot Zone is the area of immediately surrounding the site of an event. Access into this area may be permitted only by responders using proper PPE.
 2. **Warm / Contamination Reduction Zone:** The Warm Zone is an area of limited access. PPE may be required in all areas of the Warm Zone, depending on the scenario.
 3. **Cold / Support Zone:** The Cold Zone borders the outer perimeter of the Warm Zone and is a clean area set up for support operations.

5. Coordination and Communication

- a. The Incident Command System (ICS) is used to ensure effective coordination of organizations and agencies that respond in a multi-agency response scenario.

6. Field Triage

- a. In the field, triage occurs in two phases:
 1. Primary triage is the first contact with the patients and allows for a quick categorization of sustained injuries so that the Incident Commander can identify on-site treatment needs.
 2. Secondary triage occurs throughout the incident as patients are collected, moved, and treated. Only essential first aid should be provided to patients during triage.
- b. Standardized "triage tags" should be attached to patients who have been triaged, so care providers can prioritize patients and treatment. Commonly, patients are labeled with a color-coded triage tab that indicates their current status as immediate (red), delayed (yellow), hold/minor (green), or deceased (black).

7. Pre-Hospital Decontamination

- a. Patients should be decontaminated as soon as possible.
- b. In the event that thorough decontamination cannot be performed immediately, and particularly when the suspected contaminant is a rapidly acting hazard or decontamination is likely to be delayed, decontamination should be performed in two stages:

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1. Primary Decontamination: In cases in which safe, thorough decontamination cannot be performed immediately, patients should be rinsed with large amounts of water after they move away from the site of exposure and remove their clothing. This primary decontamination (or rinse) can be performed within minutes of the arrival of fire department personnel and does not require personnel to touch or even come near patients. This is not adequate decontamination, but it does reduce the concentration of many hazardous materials.
2. Secondary Decontamination: This is the term used to refer to thorough decontamination performed with the assistance of appropriately protected and trained first responders. Patients remove their clothing, place all contaminated clothing in plastic bags that can be sealed, and then wash with copious amounts of soap and water. Patients should be provided with clean clothes or other uncontaminated covering such as blankets or sheets for use after decontamination.

B. Getting Ready

1. *What Information Should the Facility Nurse Obtain?*
 - a. The following site and victim information should be obtained by the facility nurse being notified of a CBRNE emergency:
 1. Type of event and type of hazard, if known
 2. Name of agent, if known
 3. Number and condition of casualties (contaminated/uncontaminated)
 4. Estimated time of arrival
 5. Extent of decontamination in the field
 6. Signs and symptoms exhibited by patients
2. *Emergency Plan Activation*
 - a. The health facility emergency plan should be activated in the event of a:
 1. Disaster
 2. Suspected terrorist attack
 3. The emergency plan also might be activated in the event of a multi-casualty accident, which is defined as an incident that places excessive demands on personnel and equipment and involves three or more patients.
 - b. If it is unknown if casualties will be arriving, the emergency plan and the recall of staff should begin in the stand-by mode.

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3. *Emergency Management Plan*

- a. The Emergency Management Plan should delineate the steps that must be taken to prepare the ED to receive patients and should provide complete, concise lists of responsibilities for ED personnel involved in preparing for and managing the event.
- b. The following steps for preparation of patients should be taken simultaneously by different staff members according to assigned roles:
 1. Assign on-duty staff to specific tasks and areas (e.g., Triage, Immediate care area, Minor care area, etc.).
 2. Begin recall of medical and non-medical staff as necessary.
 3. Set up a triage area outside of the ED.
 4. Determine if alternative care sites should be prepared for holding or caring for patients.
 5. Assign treatment areas inside and outside of the ED as necessary.
 6. Admit or discharge patients in the ED to the extent possible.
 7. Secure the entrances to the ED.
 8. Move vehicles out of the parking area to create additional space for emergency vehicles.
 9. Bring additional gurneys and wheelchairs to the ED.
 10. Bring additional supplies to the ED as necessary. There may be pre-designated emergency carts for this purpose.
 11. Prepare materials to triage (e.g., colored wrist bands or neck tags) and register patients. Tracking materials might include pre-numbered charts with wrist bands or disaster charts similar to those used in trauma packets.
 12. Prepare the area designated to serve as the morgue.
- c. Job descriptions in the ED plan should include:
 1. ED Administrative / Charge Nurse
 2. Supervising Physician
 3. Triage Nurses
 4. ED Physicians designated as the Casualty Physicians
 5. ED Nurses designated as the Casualty Nurses
 6. Emergency Trauma Technicians
 7. Physicians from each of the other services expected to be involved
 8. Registration Clerks
- d. Provisions for hazardous exposure should be provided, including Personal Protective Equipment and preparation for decontamination of victims.

4. *Preparing for Patient Arrival*

- a. Effective organization in the early minutes following the activation of the Emergency Management Plan will have a major impact on the facility's handling of the event.
- b. The designated Incident Commander is responsible for organizing the initial response, including asking the following:
 1. Is there adequate staff?
 2. Is there adequate space to care for the patients?
 3. Are there adequate supplies and equipment?
 4. What role will other departments in the facility need to play?

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c. Emergency Management Plans provide guidance for emergency situations, and they should cover these questions to ensure safety and high-quality care.

5. Decontamination Facilities and Supplies

a. There are several options available for Hospital Based Decontamination Systems. These systems may be temporary, mobile or fixed.

b. Currently, most medical care facilities employ temporary units. Facilities should consider the set-up required for such units, along with other logistical factors that influence the practical use of the units.

C. Staff Safety

1. Containment

a. Containment is the process of controlling, arresting, or minimizing the threat of any hazard.

b. Security is the key to containment in a hospital setting.

2. What Is PPE?

a. Personal Protective Equipment (PPE) is equipment designed to protect individuals from chemical, biological, radiological, and other similar hazards.

b. According to the US Occupational Safety & Health Administration (OSHA), PPE is divided into four categories, Levels A through D. Level A represents the most comprehensive protection.

c. As a result of prior facility Hazard Vulnerability Analysis (HVA), most health care facilities generally have Level D or sometimes Level C on hand.

3. The N95 Mask

a. The N95 Mask, officially called the N95 Respirator, is a simple mask shaped to fit over the mouth and nose of the user.

b. The mask offers a high level of filtering and is specifically recommended for use when dealing with Airborne Transmitted Diseases.

c. For maximum effectiveness in preventing infection, it is important to implement a respiratory protection program. This must include ensuring the mask fits properly with a good seal. After an appropriate fit-testing program has been conducted, staff should follow appropriate procedures to don and doff the mask.

4. Use of PPE

a. The use of Personal Protective Equipment (PPE) in the healthcare facility setting depends on the training levels and responsibilities of different staff members.

b. Properly donning and doffing protective equipment is key to avoiding contamination.

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D. Decontamination and Treatment

1. Medical Facility Triage

a. Types of Patients

1. Patients brought to the facility by Emergency Medical System providers must be re-triaged upon arrival.
2. Patients arriving on their own represent different challenges. These patients have not been decontaminated and even if staff is wearing appropriate PPE, contact should be limited to prevent staff contamination.

b. Steps to Effective Triage

1. Triage capacity should be expanded, with additional space, equipment, and personnel.
2. Only experienced clinicians should be assigned to triage duties in such circumstances.
3. A simplified triage system similar to that used in the pre-hospital setting should be employed.

c. The START System Triage Categories

Immediate: These patients need resuscitation as soon as is feasible, and possibly OR and ICU care.

Delayed: These patients need an evaluation and treatment, which can be delayed, and may need admission to the OR later.

Minor: These patients need an evaluation, but it is expected that these patients will be treated and released.

Deceased: The patients need transport to the morgue.

2. Dealing with Personal Possessions

- a. Keeping track of personal possessions is important to high-quality patient care.
- b. Simple methods work best in terms of patient and personal possession tracking.

3. Patient Decontamination

a. Medical decontamination is the procedure of eliminating or reducing to a safe level any harmful substances on a person.

b. Exposure to a hazardous chemical or biological agent, or contamination with radioactive particles necessitates decontamination.

c. The goals of decontamination are to:

1. Prevent incorporation of harmful substances into the body, thereby reducing the potential for negative health effects on the victim
2. Prevent the spread of the substance to others or to the environment.

d. Not all hazardous substances require decontamination, but when in doubt decontamination should be performed.

e. Patient decontamination involves:

- Recognition of Contamination
- Patient Self-Decontamination
- Assisted Decontamination
- Radioactive Particle Decontamination
- Assessment of Contamination

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4. *Obtaining Information on Arriving Patients*

a. Two of the most important questions that need to be answered when the ambulances arrive with patients include:

1. Has the patient been exposed to contamination?
2. Has the patient been adequately decontaminated?

5. *Medical Treatment*

a. The specific medical treatments required to treat CBRNE victims depends on the CBRNE agent.

b. Common treatment for a majority of CBRNE agent exposures involves:

1. Removing the patient from the source of exposure as quickly as possible
2. Decontamination
3. Supportive care

6. *Isolation Precautions for a CBRNE Event*

a. The Centers for Disease Control and Prevention (CDC) has recommended two levels of isolation precautions for use by medical care providers:

1. Standard Precautions:

- Hand washing
- Gloves
- Mask, Eye Protection, Face Shield
- Gown
- Patient Care Equipment
- Environmental Control
- Linen
- Occupational Health and Bloodborne Pathogens (Working with Sharps and Use of Mouthpieces)
- Patient Placement

2. Transmission-Based Precautions also exist and should be followed with airborne, droplet, and contact transmitted diseases.

7. *Ongoing Health Needs* [Instructor Option: Offer facility-specific information if applicable]

a. Patients and medical personnel involved in CBRNE events might experience ongoing physical and psychological health consequences. They will continue to need medical surveillance, with periodic medical examinations and often expert consultations.

8. *Meeting Psychological Needs*

a. Following a CBRNE event, anxiety and distress can be expected from victims and their families, healthcare workers, and others affected by the event.

b. Planning to meet the psychological needs of patients, staff, and other effected individuals needs to be incorporated into facility disaster and emergency preparations.

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9. Decontamination and Doffing Level C PPE

- a. The decontamination process is not complete until all patients and staff have been determined to be free of potential contamination.
- b. Decontamination thus includes the removal (known as doffing) of Personal Protective Equipment. Proper doffing of PPE will help ensure staff safety and prevent secondary contamination.

10. Contaminated Waste Water Disposal

- a. Water used in decontamination itself becomes contaminated.
- b. This contaminated waste water must be collected and stored for later removal, and only staff wearing Personal Protective Equipment should have any contact with it.

E. Case Study

1. Lessons Learned from the Tokyo Sarin Event [Instructor suggestion: lead discussion.]

- a. When the 1995 Tokyo subway sarin attack occurred, it became the most serious incidence of terrorism in Japan's modern history.
- b. The event taught us the following lessons about emergency response systems:
 - Interagency coordination is crucial for an effective response to CBRNE events.
 - Immediate decontamination is a priority for protecting victims' health and for preventing secondary contamination.
 - Appropriate Personal Protective Equipment must be worn by first responders and medical facility staff who may be exposed to contaminated patients.
 - Medical facilities must include clear guidelines in their Disaster Plans for responding to CBRNE, including contingencies for dealing with large numbers of victims.
 - Medical facilities must conduct CBRNE disaster drills to ensure staff preparedness for responding to CBRNE events.
 - Medical personnel must have access to management guidelines for common hazardous agents.

III. PREPAREDNESS

A. Planning

1. Operational Planning for CBRNE Emergencies [Instructor suggestion: choose examples from the list below to illustrate some components of emergency plans.]

- a. Emergency Management Plans should be viewed as dynamic documents that need to be reviewed and revised in response to drills, events, and emerging threats.

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- b. The following subjects should be included in the plans:
- Personal Protective Equipment
 - Decontamination Facilities
 - Pharmaceutical Supplies
 - Additional Supplies of Critical Care Equipment
 - Access to Specialists: Infectious Diseases, Chemical Agents, Radiation, Blast
 - Injury, and other anticipated specialists
 - Security, Crowd Management, and Surge Capacity
 - Evidence Collection
 - Morgue Services
 - Patient Tracking
 - Family Reunification
 - Medical Surveillance of Exposed Staff
 - Psychosocial Support for Staff and Patients and their Families

2. *CBRNE Training* [Instructor suggestion: Describe the training plan of the facility where the training is taking place.]

- a. It is important to remember that training programs should prepare multiple staff members for each key role in an emergency plan, as this will increase the likelihood that a trained staff member will be present should a disaster occur.
- b. Proper use of Personal Protective Equipment, and setting up and operating the facility's chosen Decontamination System bear special attention in all training programs.

3. *CBRNE Drills* [Instructor suggestion: Describe facility's planned drills.]

- a. For planning and executing drills, it is important to remember:
1. Incidents should be constructed to test functionality of all systems.
 2. Performance should be evaluated after each drill, and the emergency plan modified when deficiencies in the plan are identified.
 3. Those planning the drills need to comply with JCAHO Drill Requirements (described in detail in the Videx slide).

4. *Decontamination System Implementation* [Instructor suggestion: Describe the facility's decontamination system and/or discuss issues related to evaluating, purchasing, and implementing the system.]

- a. There are currently several options available for Hospital Based Decontamination Systems.
- b. To determine which system is best for a facility, you should consider:
- Unit Designs
 - Patients Accommodated by Design
 - Wastewater Considerations
 - Environmental Considerations
 - Location of Unit
 - California EMSA's Online Evaluation of Decontamination Systems

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5. CBRNE Contaminated Waste

- a. Two primary areas of consideration for containment and disposal of contaminated waste are:
 - 1. Run-off waters from decontamination
 - 2. Solid and medical waste disposal
- b. The facility's Hazard Vulnerability Analysis helps determine the potential number of patients that may require decontamination. This can help in making plans for decontamination as well as for containment of contaminated waste.

6. Post-Mortem Care

- a. Basic principles of post-mortem care and CBRNE precautions include:
 - 1. Dead bodies can pose health risks during CBRNE events and during naturally occurring disease outbreaks.
 - 2. Individuals working in CBRNE-at-risk environments need to ensure that no contact with blood or body fluids of the dead occurs.
 - 4. Standard Precautions (e.g., facemasks, shoe covers, gloves, gowns, and eye protection) should be observed when handling dead bodies.
 - 5. Pathology departments and clinical laboratories should be informed of a potentially infectious outbreak prior to submitting any specimens for examination or disposal.

7. Staff Psychological Needs and Debriefing [Instructor suggestion: Discuss facility's plans for debriefing personnel.]

- a. Following a CBRNE event or any disaster, medical care providers and facility staff are at risk for psychological effects.

B. Facility Response

1. Emergency Department Plan

- a. The ED Disaster Plan should delineate the steps that must be taken to prepare the ED to receive patients.
- b. The ED plan should provide concise, but complete lists of responsibilities for ED personnel in preparing for and managing the event, including:
 - 1. Preparation for the arrival of patients.
 - 2. Job descriptions (or job action sheets)
 - 3. Provision of PPE, decontamination instructions, and other hazardous exposure-related information.

2. Hospital Emergency Incident Command System [HEICS]

- a. HEICS employs a logical management structure, defined responsibilities, clear reporting channels, and a common nomenclature to help hospitals and other emergency responders communicate and cooperate effectively during emergency and disaster situations.
- b. HEICS is designed to assist the medical facility in staying operational during a disaster and promotes the restoration of normal function.
- c. HEICS is the standard for health care disaster response because it incorporates a predictable chain of management. 92% of California hospitals use HEICS.

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3. Internal Coordination

- a. During declared disasters or large emergencies, most medical care facilities activate the Hospital Emergency Incident Command System (HEICS).
- b. In both large emergencies and declared disasters, Department Heads are responsible for leading the appropriate response from their staff to protect patients, staff, visitors, and property.
- c. On-duty staff is notified of an emergency or disaster by overhead page announcements, individual pages, email, verbally, personal involvement, observation, or a combination of any of these.

4. External Coordination

- a. During identified disasters and emergencies medical facilities must coordinate their efforts with other agencies in the in the Operational Area (typically the county).
- b. The Standardized Emergency Management System (SEMS) specifies that the contact is with the Medical Health Operational Area Coordinator (MHOAC) at the Emergency Operations Center (EOC).
- c. The facility Incident Commander or Liaison Officer may also need to coordinate with external agencies directly, depending on the event.

5. Identifying and Reporting Disasters

- a. Medical treatment facilities play a key role in identifying threats to public health.
- b. CBRNE threats have made this role even more important, as bioterrorism events in particular may involve covert attacks.
- c. Systems to report suspicious illnesses and identify disease outbreaks in a local population should be in place.
- d. The state of California requires that any occurrence that threatens the welfare, safety, or health of patients, visitors, or personnel must be reported to the local health officer and to the appropriate state or federal agencies.
- e. When a CBRNE event is detected by medical facility staff, immediate internal and external notification is required.

6. Responsibility of Infection Control

- a. The management of patients following suspected or confirmed CBRNE events needs to be well planned, organized, and exercised.
- b. Strong surveillance mechanisms and effective communication are paramount to rapid intervention and containment.

7. Security Measures

- a. Security planning should include provisions for:
 - Security personnel
 - Lockdown
 - Medical facility perimeter control
 - Crowd management
 - Potentially contaminated patients
 - Potential involvement with law enforcement and perpetrators

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b. Many medical care facilities will not have the staff to implement all procedures described above. Planning in conjunction with local law enforcement and local emergency response management will identify the areas of need and help facilities plan for the response.

8. Implementation of PPE [Instructor suggestion: Describe facility's plan for PPE implementation.]

- a. PPE should be in locations that are easy to access.
- b. PPE training is crucial for the safety of patients and personnel.
- c. While a minimum of Level D PPE should be available at all facilities, the Occupational Safety and Health Administration (OSHA) has recommended that hospitals employ Level C PPE for chemical agent exposures.

9. Registering Patients in a Disaster [Instructor suggestion: Describe facility's plan for registering patients.]

- a. In order to cope with the large numbers of patients presenting in a disaster, patient registration and tracking systems must be streamlined.
- b. The patient tracking system needs to be easy to understand and implement.
- c. In a disaster, additional registration staff will be needed and should be re-assigned or called back.

10. Media Relations

- a. Media Relations is an important part of any medical care facility's disaster management team.
- b. In any disaster, a representative of Media Relations should be present in the facility's Emergency Operations Center in order to interact with the senior management.
- c. Key components of the Media Relations Disaster Plan are:
 - 1. Establishing a list of local media contacts to facilitate getting information out to the media
 - 2. Establishing how the media should contact Media Relations, and distributing this information to the media
 - 3. Identifying a media relations area, away from the emergency department, ambulance bay, other patient care areas, and the Emergency Operations Center
 - 4. Identifying who should interact with the media, including identifying personnel who can function as experts for various kinds of disasters.
- d. Remember: Disasters can occur at any time, and any single individual might not be available. There should be multiple staff members capable of speaking with the media.

11. Resuming Normal Operations

- a. Disasters and large emergencies disrupt normal operations.
- b. Resuming normal operations as soon as possible is essential to the well being of each facility.
- c. Recovery (or the process of returning to normal operations) should be included in the emergency plan.

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- d. Recovery is managed using an Incident Command System (such as HEICS) until operations are sufficiently back to normal to be managed by the facility's routine management structure.
- e. Recovery steps include:
 - 1. Demobilization
 - 2. Facility rehabilitation
 - 3. Personnel rehabilitation
 - 4. Supply replacement and equipment rehabilitation
 - 5. Financial accounting
 - 6. Incident review and performance improvement

C. Government Resources

1. Medical Facility Role in Emergency Response

- a. During any disaster, facilities must be prepared to safely and effectively triage and treat patients in numbers exceeding their usual operational capacity.
- b. During a CBRNE disaster, facilities may face the added challenges of providing adequate Personal Protective Equipment to staff, decontaminating large numbers of patients who have bypassed the field medical providers, and offering psychological support to the survivors of a terrorist attack.
- c. A safe and effective medical facility response to a CBRNE emergency begins months or years before the day of the event.
- d. Medical facilities are expected to coordinate their emergency response with other facilities and agencies.
- e. Medical facilities also need to play a role in the recognition of CBRNE events.

2. Standardized Emergency Management System (SEMS)

- a. The Standardized Emergency Management System, or SEMS, facilitates priority setting, interagency cooperation, and the efficient flow of resources and information.
- b. SEMS utilizes the Incident Command System (ICS). ICS originally was developed by the fire service for managing emergency response to wildland fires. SEMS incorporates:
 - *Incident Command System*: A field-level emergency response system based on management by objectives.
 - *Multi/interagency coordination*: Affected agencies working together to coordinate allocations of resources and emergency response activities.
 - *Mutual Aid*: A system for obtaining additional emergency resources from non-affected jurisdictions.
 - *Operational Area Concept*: Counties are designated as Operational Areas to coordinate damage information, resource requests, and emergency response.

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3. *County Emergency System* [Instructor suggestion: Detail the county emergency system for the county in which the facility is located.]

- a. Every county in California is a designated Operational Area (OA) and is the entity designated to coordinate disaster response resources within its geographical boundaries.
- b. The Emergency Operations Center at each OA assists local facilities and agencies in the event of emergencies or disasters.

4. *Medical and Health Mutual Aid System*

- a. The California Governor's Office of Emergency Services coordinates the statewide Fire, Law Enforcement, and Telecommunications Mutual Aid Systems based on the "neighbor helping neighbor" concept.
- b. During major emergencies, OES may call upon all state agencies to help provide support.
- c. In a medical and health emergency, OES activates the Emergency Medical Services Authority and the California Department of Health Services to manage resource requests, information and planning activities.
- c. Other agencies activated to respond include: The California National Guard, California Highway Patrol, Department of Forestry and Fire Protection, Conservation Corps, Department of Social Services, Department of Mental Health and the Department of Transportation.

5. *California Emergency Services Agencies*

- a. The state's Emergency Medical Services Authority coordinates the procurement of medical resources during emergencies and disasters.

6. *Federal Emergency Services Agencies*

- a. Beginning in 2003, the Department of Homeland Security assumed direction for the provision of a coordinated federal response to all large-scale crises.
- b. Within the Department of Homeland Security, the Federal Emergency Management Agency (FEMA) is tasked with responding to, planning for, recovering from, and mitigating against disasters.
- c. One of FEMA's primary divisions for disaster response is the National Disaster Medical System.
- d. The federal emergency response system also encompasses an Emergency Preparedness and Response Plan, and a Laboratory Response Network (LRN) for Bioterrorism.

7. *What Is a DMAT?*

- a. A Disaster Medical Assistance Team (DMAT) is a group of professional and paraprofessional medical personnel who work as part of the National Disaster Medical System to provide emergency medical care during a disaster or other event.
- b. There are standard and highly specialized DMAT teams available as a community resource to support local, regional, and state needs.

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8. *What Is the Role of Law Enforcement in CBRNE events?*

- a. In the event of a terrorist or otherwise criminal act, federal law enforcement officials from the Department of Justice and the Federal Bureau of Investigation will be called in by local authorities to respond to the site of the disaster or emergency.
- b. The mission of the Department of Homeland Security includes providing a coordinated federal response to natural disasters and terrorist attacks.
- c. When investigations are necessary, a joint investigation between the FBI, the Centers for Disease Control, and state and local public health is coordinated through the Joint Operations Center (JOC) established by the FBI and overseen by the Department of Homeland Security.

9. *Evidence Collection*

- a. If a crime is suspected following a CBRNE event, health care providers are expected to cooperate with the law enforcement agencies that will investigate the incident.
- b. The performance of evidence collection during decontamination, triage, and treatment should be reasonable for the situation.
- c. The health care provider's first duty always is to the safety of patients and responders.

10. *Facility Pharmacy Capability*

- a. Facilities that provide emergency treatment should maintain a reasonable, daily inventory of antibiotics and antidotes currently recommended for the treatment of patients with suspected or diagnosed bacterial bioterrorist agents and chemical agents.
- b. It is not expected that medical facility pharmacies will have the capabilities to respond to a large-scale event.

11. *What Is the Strategic National Stockpile?*

- a. The Strategic National Stockpile is a repository of life-saving medical supplies that can be deployed within twelve hours wherever a national emergency is declared in the U.S. and its territories.
- b. The Strategic National Stockpile program has two major components:
 - 1. 12-hour Push Packages: Twelve separate, identical caches of pre-packaged medical supplies that are ready for immediate deployment within twelve hours of the federal decision to release them to emergency or disaster areas.
 - 2. Vendor Managed Inventories (VMI) will be shipped to arrive within 24 to 36 hours after the initial Push Package during a multi-phase or larger response. The VMI package has pharmaceuticals and supplies "tailored" to a specific type of suspected or confirmed agent or combination of agents.

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D. Internal Disasters [Instructor suggestion: Provide facility-specific information as much as possible.]

1. Internal Disaster Planning

- a. Disasters can occur near or even within a medical care facility.
- b. The emergence of CBRNE threats has made it necessary to expand the definition of internal disaster to include any natural or man-made event that directly places the care facility in the way of harm.

2. Avoiding Exposure: Facility Response

- a. The Disaster Plan should be activated if a CBRNE threat is present in or near the facility.
- b. If the hazard is within the facility, the immediate issue to address is whether it is feasible and safe to contain the threat (e.g., by evacuating and locking down a limited contaminated area) or whether it is necessary to evacuate the entire facility.
- c. The safety of patients and staff is the foremost concern.
- d. If the hazard is an external but imminent threat to the facility, the decision becomes whether to evacuate the facility or to shelter in place.
- e. The decision to partially evacuate, fully evacuate, or shelter-in-place should be made by the Incident Commander.

3. Food and Water

- a. Facilities need to keep adequate potable water and food, calculated at one gallon of water per day and a three-day supply of food per person for sheltering-in-place and/or internal emergencies.

4. Avoiding Exposure: Individual Actions

- a. Three steps need to be taken by individuals in order to avoid CBRNE exposure:
 - 1. Become aware that a CBRNE threat exists.
 - 2. Take immediate steps to avoid exposure to the CBRNE threat.
 - Maximize distance** from a suspected source of exposure.
 - Minimize the time** spent around an ongoing source of exposure.
 - Decontaminate** as soon as possible if exposure has already occurred.
 - 3. Take protective health measures to minimize the secondary spread.

5. Personal Decontamination

- a. These recommendations are provided to guide staff exposed to a hazard within the facility during a large scale CBRNE event:
 - 1. Immediately leave the area of the CBRNE exposure. Try to avoid breathing in smoke or particles. If appropriate Personal Protective Equipment is not available, a moist cloth held over the nose and mouth offers some protection. Proceed immediately to the specified decontamination area if it is nearby and is ready to receive casualties. If there is no available decontamination facility, you must use available resources to decontaminate yourself.

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2. Remove all clothing and thoroughly wash yourself with mild soap and water. If soap is not immediately available use as much water as necessary to remove any contaminants from the skin.
3. If water is not immediately available, attempt to wipe off any liquid, aerosol (fine mist), or particle contamination that is on your body. This effort must be followed by washing thoroughly as soon as possible.
NOTE: Do not abrade your skin by washing or scrubbing too hard.
4. Other portals of entry for CBRNE agents into the body include the eyes, mouth and nose. Rinse these body parts thoroughly with water. Avoid eating, drinking, and smoking in a contaminated area.
5. Do not touch or put back on contaminated clothing. Seal your clothes in a plastic bag, if available. Store the bag away from people.

6. *Locking Down and Sheltering-in-Place* [Instructor suggestion: If you are speaking to administrators at a large hospital facility, consider discussing Safe Room Selection and Supplies, as seen in the Videx slide.]

- a. When a CBRNE event directly involves a medical care facility, facility leadership will need to decide whether to:
 1. Lockdown and contain the area of the event, or
 2. Evacuate an area within the facility, or
 3. Evacuate the entire facility, or
 4. Shelter-in-Place in a pre-designated area.
- b. In most cases, evacuation of an area or the entire facility will be the safest scenario.
- c. A lockdown and shelter-in-place response would be appropriate if a nuclear explosion was anticipated.
- d. In larger facilities, where it would take too long to shut down the ventilation system in the event of a toxic chemical plume or nuclear explosion, the management should consider whether the risks warrant the implementation of safe rooms.

7. *Evacuation* [Instructor suggestion: Briefly describe each type of evacuation if appropriate for the facility where training is taking place.]

- a. Evacuations are coordinated efforts that involve many people. All directions and activities must be clearly communicated and understood by participants.
- b. Employees must be familiar with the different types of evacuations, when each is appropriate, and how to perform the duties necessary to ensure an effective and efficient evacuation.
- c. Patient care and safety must always be maintained.
- d. The Chief Operating Officer, Incident Commander, Administrator-on-Call or Nurse Supervisor-on-Duty, may order the evacuation of a patient care area.
- e. Types of evacuation include:
 1. Defend in Place
 2. Horizontal Evacuations
 3. Vertical Evacuations
 4. Building Evacuations

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8. Alternate Care Sites

- a. Alternate care sites are designated areas suitable for caring for a substantial number of patients outside normal patient care areas.
- b. Traditionally, medical care facilities have discussed alternate care sites as places where patient care takes place if the facility has to be evacuated. However, a broader definition is needed in order to plan for the surge of patients that may accompany a large scale disaster.
- c. Alternate Care Site Plans, included in the emergency plan, can be activated when:
 1. Evacuation of all or part of a medical center is required, or
 2. During a large influx of patients to augment the facility's capacity to treat incoming patients.

E. Case Study

1. What Lessons Were Learned in Nairobi? [Instructor suggestion: Lead discussion.]

- a. In 1998, two explosive devices were detonated near the United States Embassy in Nairobi, Kenya. The explosions killed more than 200 people instantly. Over 4,000 people were injured in the blasts.
- b. Lessons learned as a result of the event include:
 - Medical care facilities in close proximity to an explosion may receive large numbers of patients who arrive both by emergency medical transport and by private means. Surge capacity must be addressed in emergency plans, and alternate care sites must be included as well.
 - Patients may present on an ongoing basis with varying degrees of sustained injuries.
 - The collective shock experienced by victims of terrorism can cause severe psychological trauma. Medical care providers should be prepared to offer psychological first aid in addition to other services.
 - Disaster drills and other simulation-based training are critical for effective response in the case of a real event.
 - Debriefing medical facility personnel following a CBRNE event is extremely important.
 - Resources such as radiology services, operative suites, technical medical supplies, and laboratory testing should be coordinated and used cautiously so as not to overwhelm and expend them prematurely in a large disaster event.

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Appendix E.

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